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PUBLIC REACTIONS TO WIND ENERGY DEVICES

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FINAL REPORT
October 1977

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Directorate for Applied Science
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and the
DEPARTMENT OF ENERGY

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Report prepared by: Survey Research Laboratory, University of Illinois

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I. OVERVIEW OF THE STUDY

A. Background

The feasibility of utilizing windmills and other wind devices to produce a share of the country's energy needs seems well established by now. For some locations, such as isolated areas or small towns far removed from major population centers, electric energy could be generated more efficiently by wind energy devices than by other means, while in more settled areas, wind devices could supplement existing energy-generating procedures. Although future engineering developments will undoubtedly improve the efficiency of these devices, there is no question that progress in this field has reached the point where it is time to put these concepts and ideas into practice and see how they work.

At the same time, growing public interest in all aspects of the environment suggests that before such wind energy devices can be implemented on a wide scale, attention needs to be given to possible public reaction to them and the extent to which the public is willing to accept this type of technology. Numerous instances already exist of technological developments that were feasible and economic but which, because of public dissatisfaction, had to be either modified or discarded altogether.

This matter is particularly relevant in the case of wind energy devices, which for maximum efficiency would have to be placed in large numbers at various locations around the country and which would occupy highly prominent positions in those locations. The willingness of the public, and its elected representatives, to accept such a modification of the landscape is likely to be a major determinant of whether plans for wind energy generation could be implemented in their present form and the extent to which such plans might have to be modified to gain the necessary public acceptance.

B. Objectives

In line with the need for such information, this study was undertaken by the Survey Research Laboratory of the University of Illinois to explore reactions of the general public toward different types of wind energy devices for generating electric energy. More specifically, the objectives of the study were twofold:

1. To provide substantive information on public acceptance of different types of wind energy devices in different settings
2. To furnish a methodological base for more intensive studies of public acceptance of such devices

In connection with both of these objectives, information was also gathered on general attitudes toward wind and other forms of energy. Such information is of considerable value in itself, as indicative of the extent to which the public supports the development of wind energy; also, it is of great relevance for exploring whether any relationships might exist between general attitudes and reactions to different wind energy devices.

C. The Data

The study was carried out by conducting personal interviews with statistical random samples of adults in six different parts of the country, with primary emphasis on rural and smaller urban areas. The locations selected were western Michigan, southeastern Wyoming, western Washington, eastern Rhode Island, the Chicago area, and the Sandy Hook Unit of the Gateway National Recreation Area in New Jersey. Those interviewed were questioned on a number of topics, including their attitudes toward sources of energy, their knowledge of wind energy devices, and their opinions on paying extra for pollution-free sources of energy. In addition, they were shown slides of different wind energy machines in various settings and were asked to indicate their preferences from an aesthetic point of view.

A special feature of this study was that in one of the sample areas, these interviews were conducted while the respondents actually viewed a windmill. As part of the study, a windmill was constructed near the beach at Sandy Hook, New Jersey, in the Gateway National Recreation Area, and was used specifically for this purpose. As an adjunct to the study, information was also obtained from self-administered questionnaires distributed to visitors at the NASA Lewis Research Center's wind energy machine at Plum Brook, Ohio. Although the latter were not part of the original study design, they do provide an added dimension that is very useful for the present purposes.

Before presenting the results, a brief summary of the data would seem helpful. The six areas of the country in which the personal interviews were conducted are highly diverse, ranging from a farm area to a rural nonfarm area to smaller urbanized areas to one of the major metropolitan areas of the country, and including a national park. Approximately 300 people were interviewed in each of these areas. For comparative purposes, a second wave of interviews with a sample similar to the first was conducted at the national park after the windmill had been erected.

The sample members, who were selected by statistical probability methods, represented a wide range of socio-demographic characteristics. Only adults (18 years of age or older) were interviewed. The overall sample in the five areas in which household interviews were conducted contained somewhat more women than men (a 54-46 split) and had an appreciable number of nonwhites only in the major metropolitan area (Chicago). In terms of age, 26 percent of the sample were under 30 years of age, 29 percent were between 30 and 44, 22 percent between 45 and 59, and 23 percent 60 years of age or older. Approximately 70 percent of the respondents lived in homes owned by themselves or their family, although this percentage varied somewhat by area.

D. General Attitudes

The results of this study may be categorized under three main headings: general attitudes on wind energy and other energy sources, reactions to wind energy and different types of wind energy machines, and methodological aspects. It is within this framework that the findings of this study are summarized in this and the following sections of this chapter.

People are basically very favorable toward the use of wind and solar sources for electric energy production.[1] These two sources, along with hydroelectric power, received favorable mention by approximately 75 percent or more of the sample members at each of the six interview locations, preference figures far higher than those accorded to the other alternatives presented--nuclear energy, deep-shaft coal, strip-mined coal, oil, and natural gas.

The favorable light in which wind and solar energy are held became further apparent when people were asked to indicate what they felt to be the advantages or disadvantages of each of the eight electric energy sources considered. In the case of solar and wind energy, very few disadvantages were cited, and the ratio of advantages to disadvantages was far higher for these energy sources than for any of the others except hydroelectric power, where the margin of superiority was slightly less than for solar energy.

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[1] Technically, wind energy is a part of solar energy. However, in this study, the two have been treated separately, since, the public mostly understands them as two distinct sources.

Preference for solar and wind energy does vary somewhat, however, by the socio-demographic characteristics of the sample members. The general tendency was for those with more education and higher incomes to favor solar and wind energy more frequently than those with less education or income. This was also true of younger people to a lesser extent. Whites were much more likely than nonwhites to favor both solar and wind energy, at least in the Chicago area, the only site where the sample included an appreciable number of nonwhites.

From the point of view of development of wind and solar energy, it is interesting to note that, at least at the time when this survey was conducted (spring and summer of 1976), people seemed strongly opposed to a policy of rationing energy usage. When asked to choose among three different energy policies, ranging from unlimited U.S. production and importing whatever else is needed to rationing energy, most respondents seemed to favor the middle course of having some form of limit on energy use, provided that it were coupled with a program to reduce our dependence on imports from other countries. In other words, people generally do not want to limit energy use unless it served to reduce our dependence on imports. For this reason, they are likely to be supportive of the development of additional energy sources within this country.

Differences in these attitudes are apparent by socioeconomic groups, with policy of maximizing energy production and importing anything else needed being favored more by those in professional and managerial occupations, by those with more education, and by those at higher income levels.

In general, these were the same groups that were also likely to be more favorable toward paying extra for pollution-free energy. Indeed, the results suggest that the demand for pollution-free energy is very strong among substantial proportions of the population. A price increase of 10 percent in exchange for pollution-free energy would undoubtedly be accepted overwhelmingly, especially with dissemination of appropriate explanatory information. In fact, a price increase of as much as 25 percent might receive considerable support, although a more substantial price increase, such as 50 percent, would clearly encounter major resistance.

E. Public Acceptance of Wind Energy Devices

The results on public acceptance of wind energy devices are best summarized in two parts: those relating to knowledge and general reactions to wind and solar energy and those relating to specific windmill designs in different settings.

1. Knowledge and Attitudes

The findings suggest that some knowledge of solar energy as a source of electricity is widespread but that a much smaller proportion of the population has similar knowledge about wind energy. Knowledge of both solar and wind energy tends to vary rather substantially with the socio-demographic characteristics of the individuals, being highest among those with more education, among those in white-collar occupations, among those with higher incomes, and among men rather than women.

While most people in all of the areas sampled except one felt that the use of windmills for electric energy was a good idea, the exception is in the area where knowledge about wind energy is by far the lowest, namely, the Chicago metropolitan area. This may reflect the highly urbanized nature of the area and the feeling that this type of energy may not be of much use there. However, there is no question that the relatively negative attitude of those in the Chicago area toward the use of wind energy for electricity production is due to the much stronger opposition of nonwhites to this idea. From the data in the present study, however, it is not possible to ascertain whether this difference is due to race or to their location in the Chicago area.

Objections to locating windmills in different types of places are clearly influenced by people's feelings on the desirability of using wind energy for generating electricity--as many as half of those respondents who thought that this was a poor idea objected to placing windmills in various locations, especially along shore lines. Overall, however, disapproval of shore-line locations was voiced by less than a third of those interviewed in any of the six samples, with objections to other types of locations being even less frequent.

2. Windmill Designs

The results on preferences for various wind energy devices relate to six different windmill designs: the Darrieus (eggbeater) design, the old Dutch windmill, the Giromill, and horizontal axis machines on three different towers--a lattice tower, a simple columnar tower, and an old Dutch tower. These windmills were pictured in slides using three different scenes: a flat-land setting, a setting of hills, and a shore setting. (See Appendix A for reproductions of the slides.)

The survey results strongly suggest that the old Dutch motif dominates people's preferences. This type of design was preferred by a 4-to-1 margin over the horizontal axis lattice tower machine and by a 3-to-1 margin over the horizontal axis columnar tower machine. Moreover, whereas respondents seemed indifferent between a horizontal axis lattice tower windmill and a Darrieus design, the preference shifted to nearly 2 to 1 in favor of the horizontal axis machine when it was placed on an old Dutch tower.

Of the six designs shown, the order of preference would seem to be the old Dutch as the overwhelming favorite, followed, in descending order, by the horizontal axis machine on an old Dutch tower, the horizontal axis machine on a columnar tower, a toss-up between the horizontal axis machine on a lattice tower and the Darrieus machine, and, lastly, the Giromill. For the last three of these designs, a majority of respondents felt that the setting in which these machines were pictured would be more pleasing if the machines were not there.

Attitudes toward different designs did not seem to vary much from one setting to another, at least for the relatively small samples used in this analysis. There was some tendency for the old Dutch windmill to be preferred, even more in a shore setting, and there was also some inclination for a greater proportion of people to prefer the horizontal axis machine on a lattice tower in a prairie, or flat-land, setting.

The results also suggest that strings of windmills are likely to be only slightly better received than strings of power lines. Although a scene with windmills was preferred over the corresponding one with power lines by margins of from 3 to 1 to 4 to 1, even for the windmills approximately 60 percent of those interviewed felt that the scene would be more pleasing if the windmills were not in the picture.

Interviewing people in the presence of a windmill, in this case a small, 6-kilowatt, three-bladed, horizontal axis machine on a 40-foot tower, seems to have relatively little effect on their attitudes toward wind energy. Insofar as these effects are measurable, however, they seem to be on the positive side, with people somewhat more in favor of pollution-free energy even if it meant higher costs for electricity.

The presence of a windmill seems to have a noticeable effect on reactions to different designs. In the present instance, viewing an actual horizontal axis machine led people to record more negative reactions to that type of machine and to prefer other types more frequently.

Whether this is a general phenomenon remains to be seen. The windmill erected at Sandy Hook is not especially attractive, and it should be possible to make considerable improvements in its appearance without affecting performance.

On the other hand, a convenience sample composed of visitors to the 100-foot tower, 100-kilowatt NASA windmill at Plum Brook, Ohio, were much more favorable to it than were those who viewed the horizontal axis machine at Sandy Hook. From an aesthetic point of view, not only did they feel that it did not detract from the landscape but also large majorities thought that this machine would be acceptable on a shore or coast, in a national park, and even near their own homes.

The major caveat, however, is the highly questionable nature of the sample. Coming specifically to see this machine, the sample at Plum Brook clearly represented a special interest group, one that would be expected to be much more favorable than other groups toward wind energy. Typifying this lack of representativeness is the fact that over 90 percent of this sample indicated a willingness to pay 10 percent more for pollution-free energy, compared with figures ranging between 61 and 84 percent for the probability samples selected in the six other parts of the country. For this and other reasons, the highly favorable reactions obtained from this sample must be regarded as probably overstating the reaction that would be obtained from a statistical probability sample of the general population.

Considering the responses of the more representative sample at Sandy Hook (see Chapter VI, A.1.), it is clear that showing people slides of windmills does not give a completely accurate indication of the acceptance of actual machines. The obvious solution to this lack of comparability is to use the most realistic version of the machine possible under given circumstances. The possibilities for more realistic presentations include larger, more detailed slides or pictures, three-dimensional slides, motion pictures of simulated views using prototype models, or the construction of actual machines as near in size as possible to those considered for eventual use.

3. A Methodological Note

A multivariate analysis using regression techniques applied to the results dealing with both attitudes toward wind energy and preferences for different windmill designs corroborated the cross-tabulations for this study. In particular, the regression analysis showed the pronounced tendency for those with more education to be more frequently in favor of paying additional costs for pollution-free energy and also for those at higher income levels to have similar attitudes. The fact that this simultaneous approach found independent effects of education and income is strong evidence that these two factors have distinct effects on attitudes toward these energy questions.

Those with more education also seemed to be more innovative in the sense of preferring newer windmill designs over more standard ones and being less influenced by the traditional old Dutch design. Interesting too is the fact that younger people were apparently more willing to pay extra for pollution-free energy.

The regression analysis also revealed noticeable differences among the various samples. Thus, those in the Chicago area and in western Michigan were less knowledgeable about solar energy, with those in the Chicago sample less likely to have heard of wind energy as well. Members of these two samples were also less willing to pay extra for pollution-free energy. However, a positive attitude toward paying extra was apparent for the Washington and Wyoming samples.

The results also suggest that, holding other variables constant, males are more likely than females to have heard something about solar and wind energy and are less likely to prefer the old Dutch windmill.

F. Methodological Aspects

The experiment of interviewing samples of people at the same location before and after the erection of a windmill would seem to suggest that although the presence of a windmill has little effect on attitudes toward wind energy, it does have a noticeable influence on reactions to alternative windmill designs. In addition, the technique used to display the different windmill designs, that of showing color slides in a portable lighted slide viewer under magnification, seems to have worked very well.

Turning to another methodological aspect, the multivariate approach used in the later part of this study serves to highlight the fact that certain socio-demographic variables are much more important than others and should be given special attention in future studies of this type. These variables are education, income, age, sex, and race. On the other hand, such variables as occupation, marital status, and homeownership seem to be of lesser importance, although they should not be disregarded altogether in future studies.

The favorable attitude toward wind energy conversion by people with certain socioeconomic characteristics, particularly by those with more education, may partially reflect the impact of educational and proselytizing efforts in certain types of media that are read more frequently by people with these characteristics. If so, the key influence would be the media to which people are exposed rather than the socioeconomic variable.

There is little doubt that the media do have differential readership and differential impact on varying groups of the population and, moreover, that their effect in this regard may interact with a variable such as education. In other words, publicity about wind energy conversion may have a greater influence on people with more education than on those with less education. Without additional work, however, it is not possible to separate these effects. Among other things, that work would require information on the sample members' use of different media, data that were not collected in this study. All that can be said at this time is that some such effect due to selective media exposure is possible but that variables such as education will very likely retain their significance, in part because it is these variables that influence media exposure in the first place.

G. Implications for Policy

The results pertaining to wind energy are perhaps best interpreted when placed in perspective to people's overall attitudes on the subject of energy. In particular, two basic attitudes seem to dominate their thinking. First, Americans want plenty of energy, but preferably not from overseas.

Second, they would apparently be willing to pay more for this energy if it were pollution free.

Given this basic outlook, it is not surprising to find that people are generally much more favorable toward the production of electricity from solar and wind energy, and also from hydroelectric power, than from such sources as nuclear energy, coal, oil, or natural gas. These latter forms are regarded much more negatively, partly because of their polluting nature, partly because of limited supplies and the spector of reliance on supplies from other countries, and, in the case of nuclear energy, because of skepticism over safety and feasibility.

This does not mean that people are fully sold on wind energy or on other forms of solar energy. However, it is clear that they would *like* to be sold on these sources. Their doubts relate primarily to the question of feasibility. Can wind energy provide enough electricity to make it worthwhile? Can it be depended on? Can it be produced at a price that people can afford?

The subject of aesthetics is mentioned only occasionally when the question of wind energy is raised. The reason is that most people know very little about wind energy and even less about how a wind energy conversion system would actually work. It is apparent that most people think of windmills only in terms of the Dutch type or of the multivane fan used in this country to pump water. They may have come across one or two articles in newspapers or magazines about the use of windmills for electricity, and they may have seen a picture of the NASA machine at Plum Brook, but they seem to have virtually no conception of an operational system for producing electricity from wind power. Hence, the question of the aesthetics of wind energy systems is not likely as a rule to come up in general discussions of energy sources, even of wind energy.

Bringing up these questions of aesthetics and possible visual pollution by means of direct questions and slides of different wind energy machines produced some very clear reactions. For one thing, contrary to what might have been thought, the sample members did not seem to have any objections in a general sense to locating windmills in scenic areas, on the shores of lakes or oceans, or, for that matter, even close to their homes. At least, the minority that objected to the idea of placing windmills in different types of locations varied very little by the nature of the location. On the other hand, interpretation of these reactions needs to be tempered by the fact that, as noted previously, people know very little about what sort of wind energy machine would be part of an operational system, so that their responses were more abstract in nature and did not necessarily deal with reality. Especially pertinent in this connection is the fact that the sample members were shown the slides of different windmill designs only after the general attitudinal questions had been asked.

The results obtained from the use of the slides show that people have strong preferences about windmill designs. Moreover, these responses indicate a possible conflict between the type of design that people prefer and the types that are likely to be most efficient. People seem overwhelmingly to prefer the Dutch-type design, especially if placed along shore lines. Whether this is because of the bicentennial last year with its emphasis on tradition or because of a deep-seated preference for this type of structure is not clear. There is no doubt, however, that such a preference exists and that issues of visual pollution are much less likely to arise with windmill structures of this type.

The issue could be accentuated if windmill farms were planned, since respondents' reactions to a string of horizontal axis windmills were only slightly less favorable than to a string of power lines. This makes the design problem all the more critical from the point of view of public acceptance.

While a definitive solution to this question will obviously require much more work, certain possibilities do suggest themselves based on the results of this study. One possibility is to attempt designing towers of a very simple columnar nature. Towers of this type received good acceptance, although not as good as the Dutch-type tower. Conceivably, it might also be possible to design a modification of the Dutch-type tower that would be more simple and modernistic. People seem to be impressed favorably by modernistic designs, and if one of those could be incorporated with a Dutch-type motif, public reaction might be highly favorable.

A second major possibility relates to the use of color. To judge by random remarks, an attractive color design, such as that of the NASA Plum Brook machine, can be quite effective in dealing with the problem of aesthetics. Perhaps through the use of a number of different color designs, depending on the site and the background, these windmills might achieve higher public acceptance. In particular, it might be desirable to experiment with different alternatives, ranging from a color design that makes a machine stand out in the landscape to a color design that blends the machine into the landscape.

From an aesthetic point of view, the question might also be raised whether it would be more acceptable to have one huge wind energy machine at a site rather than a number of smaller ones that produced the same amount of power. Obviously, this not only is a question of aesthetics but also might be worth considering if the engineering aspects indicate that this is a viable alternative.

H. Some Unanswered Questions

Given the widespread lack of knowledge about wind energy conversion systems, how realistic are the answers regarding people's acceptance of wind energy and their attitudes toward different wind energy designs? Although this study, and especially the use of color slides to show different designs, produced a great deal of information, people were clearly thinking in the abstract when they responded to these questions. What is needed, therefore, is a means of making people more aware of the practical aspects of wind energy conversion systems, and then obtaining their reactions and attitudes.

Also needed is a more in-depth investigation of the nature and accuracy of the knowledge that people have about wind energy and the relation of this knowledge to their attitudes on the subject. Thus, it is evident from this study that most people who have heard about windmills and wind energy are more favorable than others toward this energy source. However, the extent and accuracy of this knowledge were not sought. and they could be key variables in explaining why such people are more favorable in most cases but are less favorable in others. The dimensions of this knowledge issue and its relation to attitudes need to be investigated.

It would be interesting to set up an experiment to evaluate the effects that an educational program giving the public more information about wind energy conversion systems would have on attitudes toward wind energy. Such a before-and-after experiment could take various forms, depending on the nature of the educational program and the scope of the evaluation phase, and should yield much useful information on the extent to which knowledge about wind energy might influence attitudes.

A very different way of acquiring more information on the relation between knowledge and attitude would be to interview people who know wind energy conversion systems best, namely, individuals actually owning and using windmills for producing electricity, and obtain information about their experiences and attidues toward such systems. Such an investigation should also yield much useful information relative to the marketing and operation of windmills for electric power.

I. Organization of This Report

The detailed information on which these findings are based is presented in the following chapters. As a prelude, the next chapter provides information on how the study was conducted and gives data on the response results obtained with the survey instruments. The analysis of people's overall attitudes toward some of the basic energy questions is the subject of Chapter III. Reactions to specific questions about wind energy are discussed in Chapter IV, and reactions to different windmill designs in different locations are covered in Chapter V. Chapter VI contains a discussion of the effects of the presence of a windmill on opinions. Chapter VII takes a multivariate approach to the problem, investigating the extent to which the bivariate comparisons provided in the earlier chapters retain their validity when the key variables are considered simultaneously, in this case using the statistical method of multiple regression.

Six appendices round out this report. The first presents pictures of the windmill slides shown to respondents, and the second describes the special sampling procedures used at Sandy Hook. Copies of the four questionnaires are provided in Appendix C, and the effects of rotating the order of the slides are considered in Appendix D. The fifth appendix discusses various characteristics of the respondents, and the last contains supplementary tables.

II. PLAN OF THE STUDY

A. About This Chapter

This chapter focuses on the methods used to carry out this study. An understanding of these methods is essential to a proper evaluation of the detailed results presented in the later chapters.

A review of the specific objectives, presented in the next section, establishes the framework for the study. These objectives and the pilot nature of the study influenced the design of the research plan presented in Section C. The remaining sections of this chapter provide information on the individual stages of the operation, including the selection of sites and of sample members, questionnaire preparation, data collection, and data reduction and processing. Of particular relevance to an evaluation of the results in the later chapters is the information presented in the section on data collection relative to the number of people interviewed, response rates, and possible biases.

It should be stressed that although numerous studies have been conducted on probable acceptance of a new product, the plan of this study was carried out with the belief that it was the first to investigate public acceptance of wind energy devices. Since all "new product" studies contain numerous pitfalls and each has to be designed with reference to the particular type of product or service, it seemed desirable, in keeping with the pilot nature of this study, to use various techniques for obtaining the necessary information and to test them in different parts of the country.

B. Specific Objectives

The specific objectives of the study were twofold. One objective was to provide a preliminary body of substantive information on public acceptance of different types of wind energy devices in different settings. The second objective was to furnish a methodological base for more intensive and more definitive studies of public acceptance of such devices. In other words, this study was intended to provide information on the extent to which different types of windmills are likely to be accepted by different segments of the population and the extent to which particular types of windmills are likely to meet public opposition. At the same time, it was designed to explore different approaches to obtaining this information and to evaluate the validity and efficiency of these different approaches for more intensive work at a later time.

It was felt that attainment of these twin objectives on a full scale would provide considerable information on the types of windmills and locations likely to meet public opposition, thereby avoiding costly design and construction activities and increasing the likelihood that the wind energy devices that are put into operation will meet public acceptance. Obtaining such public acceptance is of crucial importance for the wind energy program.

One other aim of this study was the development of a methodology for ascertaining public acceptance of different wind energy devices, so that public reactions to new designs can be ascertained very efficiently and economically in the future.

C. Research Plan

In view of the fact that the initial construction of windmills for generating electric energy is likely to take place in rural areas and in relatively isolated smaller urban areas of high wind power, it seemed logical to focus the main part of the study in these areas. At the same time, some preliminary coverage of major urban areas of the country was provided, since if the efficiency of windmill power is established, its use in the major urban areas of the country, at least for supplementary purposes, could be only a matter of time. Therefore, it seemed desirable also to begin collecting information on the reactions that people in those areas have to different types of windmills.

Taking these considerations into account, it was decided to carry out this study in six parts of the country that are very different both geographically and in terms of the socio-demographic characteristics of the population, namely:

1. Western Michigan by the shores of Lake Michigan
2. Southeastern Wyoming
3. The far western part of the state of Washington
4. The eastern part of Rhode Island
5. The Chicago metropolitan area
6. A beach area in the Gateway National Recreation Area at Sandy Hook, New Jersey

These areas are highly diverse and include a partly rural and partly small-town area in the Midwest, a primarily rural ranching area in the Great Plains, a lightly settled rural nonfarm area in the Pacific Northwest, a fairly heavily settled area on the East Coast, one of the major metropolitan areas of the country, and a heavily visited area in a national park. All of these are areas of relatively high wind power.

A unique feature of the study was the construction of a small windmill in a national park. The reason was to try to validate the information obtained in the interviews in the various other parts of the country. Such calibrating information was obtained by interviewing a sample of visitors to the site before the machine was erected and then interviewing another sample after the machine was in operation. Although it was not possible to interview the same people in each wave, differences in responses from the two samples to the same questions should reflect the effect of first-hand viewing of a small, modern windmill and should dispel any romantic ideas that may exist regarding the similarity of these windmills to the old Dutch variety.

It should be pointed out that the Sandy Hook data presented in the bulk of this report are based on the Wave I interviews conducted before the windmill was constructed. The Wave II data are used only in Chapter VI, where the results for the two waves are compared.

Although not part of the original study design, another opportunity to obtain information of this type was provided by the NASA Lewis Research Center, which offered to distribute self-administered questionnaires to visitors who came to view the 100-kilowatt wind energy machine at its Plum Brook site near Sandusky, Ohio. While this had to be a convenience rather than a probability sample, it nevertheless provided the only sort of information obtainable on public reactions when viewing a possible forerunner of wind energy machines that might in the future be installed all over the country. Since the data collected at Plum Brook were not part of the original plan and are not comparable to the information collected in the other survey areas, they have not been included with the findings from those areas but are treated separately in Chapter VI.

The basic rationale in this study was to use different approaches in the interviews to ascertain public awareness and reaction to different windmills in alternative locations. A basic part of every interview was the use of a slide-viewing device so that sample members could be shown landscapes and pictures of different types of wind energy machines in a more realistic manner. The original plan was to use 3-dimensional viewing devices, but the difficulty and cost of doing so prohibited their adoption in this pilot study. (In a larger scale study and with more time, however, their use should be considered.) As a result, only 2-dimensional slides were used, but they were in full color and the magnification provided by the viewing devices (4x4) seemed to give a realistic portrayal of the windmills and of the settings in which they were located. More information on the content of the questionnaires is provided in a later section.

D. Selection of Sites and the Sample

As noted earlier, the study plan called for surveys to be conducted in six areas, five of them residential locations and one a beach area in a national park. The residential locations were selected along county lines and were as follows:

1. The western Michigan counties of Mason, Oceana, and Newaygo. This area includes a number of small towns, of which the largest is Ludington (9,000).
2. The Wyoming counties of Natrona, Converse, Carbon, Albany, Platte, Goshen, and Laramie. This area includes the cities of Cheyenne (41,000), Casper (39,000), and Laramie (23,000). With the exception of Rawlins (8,000), there are no other towns in this area with populations of over 5,000.

3. The Washington counties of Clallam, Jefferson, Grays Harbor, Mason, and Pacific. This area includes no towns with populations of over 20,000. Only three towns have populations of over 10,000 (Aberdeen, Port Angeles, and Hoquiam).
4. The Rhode Island counties of Bristol and Newport. The vast majority of both counties is urban and within either the Providence-Warwick-Pawtucket or Fall River SMSAs. The cities of Bristol (18,000) and Barrington (18,000) dominate Bristol County (46,000), while the cities of Newport (35,000) and Middletown (30,000) comprise a majority of the population of Newport County (95,000).
5. The six Illinois counties in the Chicago metropolitan area--McHenry, Lake, Kane, DuPage, Cook, and Will, including the city of Chicago.

A map showing these areas is presented in Figure 2.1.

The area in western Michigan is of particular interest because it includes the small city of Hart, near the shore of Lake Michigan, where there has been considerable controversy over the possibility of constructing a large windmill operation partly to replace a generator owned by the city. As a result, one would expect the people in the area to be more knowledgeable about wind energy, given the publicity on the subject in the local newspapers.

In each of these five areas, a statistical probability sample of approximately 400 households was selected by area probability methods, so that every household in the area had an equal chance of falling into the sample. It was felt that this sample size would be large enough to yield the desired number of about 300 interviews after deducting noncontacts and refusals. In addition, for purposes of the pretest, a corresponding sample of 60 households was selected in two of these areas, namely, Chicago and western Michigan.

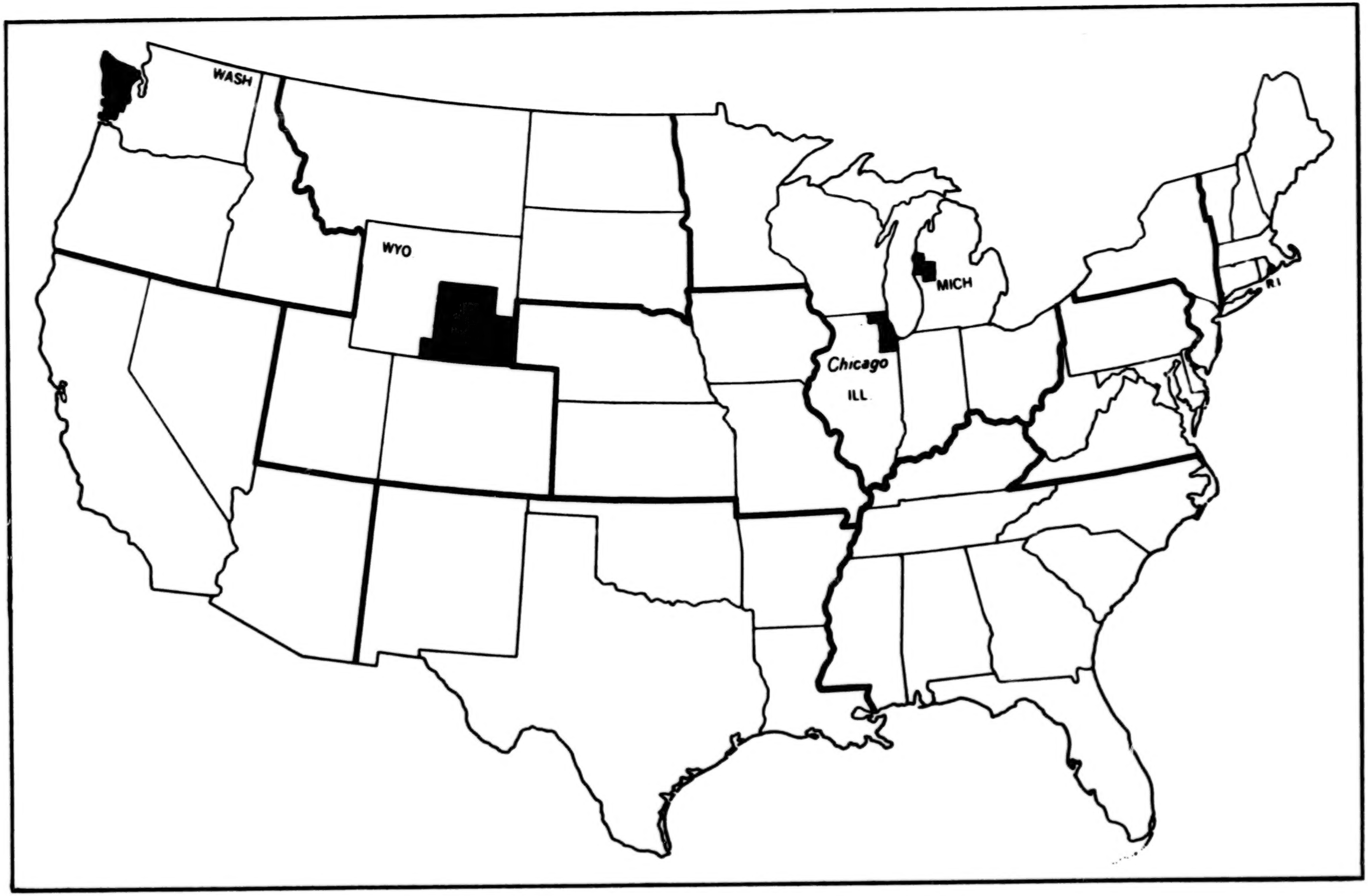

Fig. 2.1. Areas Included in the Five Household Surveys.

In all of these areas, interviewers were given random assignment forms for selecting which member of the household to interview, so that here again the selection was on a strict probability basis. While more time consuming and expensive, this procedure serves to ensure that interviewer bias does not enter into the sample selection process.

The sampling procedure at the Sandy Hook Unit of the Gateway National Recreation Area was necessarily different. Here the problem was to select a random sample from among the thousands of visitors to the particular location where the windmill would be erected. This was done by time probability sampling using a method that allowed approximate equal probability sampling to all autos entering the area during a designated two-week period. Two separate sampling plans were prepared, one for the sample to be interviewed in June and July (before the windmill was erected) and the other for the sample in September (after the windmill was in operation). The details of the sampling for these two waves are given in Appendix B.

At the seventh site, the NASA windmill at Plum Brook, Ohio, data collection was carried out fortuitously, as explained earlier, and thus could not by its nature involve much probability sampling. At this site, the guards at the gates were instructed to hand one questionnaire to each carload of visitors and ask alternately for a man or a woman to fill it out and return it when leaving the area. This procedure was used in an attempt to ensure more or less equal representation by sex but not on any other basis. At the least, it was felt that this would provide some idea of the opinions of the visitors to that site, with some information on the characteristics of these individuals.

E. Questionnaire Preparation

In line with the original proposal and the additional data collection at Plum Brook, Ohio, four questionnaires were developed. A so-called main questionnaire was designed for interviewing sample members in the five areas for the household surveys. A slight modification of that questionnaire was used for the Wave I interviewing of visitors to the Sandy Hook Unit of the Gateway National Recreation Area before the small windmill was erected at that site. A third questionnaire was devised, based on the Wave I questionnaire, for interviewing visitors to the Sandy Hook area during Wave II after the windmill was in operation. A fourth questionnaire, to be self-administered, was needed for the data collection at the site of the NASA windmill at Plum Brook, Ohio. This questionnaire was much shorter than the others, although using some of the same questions, and was designed to fit on a single sheet of paper. These four questionnaires are reproduced in Appendix C.

To be most useful, these questionnaires had to be very similar. This was especially the case with the two Sandy Hook questionnaires, since the major objective of the Wave II interviews was to ascertain how people's answers to questions on wind energy and wind energy machines might be influenced when they viewed an actual windmill. In line with these considerations, the main questionnaire, as well as the Wave I questionnaire for Sandy Hook, was designed to include a number of general questions on wind energy as well as certain specific ones that could be replicated on the Wave II questionnaire. In addition, the latter questionnaire necessarily had to include some questions about the windmill that people would be viewing at the time of the interview.

In the main questionnaire, the sequence of questions was as follows (numbers in parentheses refer to question numbers in the questionnaire, reproduced in Appendix C):

a. Use of electricity in the home (1)

b. Attitudes toward alternative energy policies (2)

c. Attitude toward different sources for generating electricity and advantages and disadvantages of these sources (3,4)

d. Attitudes toward using pollution-free energy even if cost of electricity increased (5)

e. Knowledge of solar energy and wind energy (6,7)

f. Attitudes toward idea of using windmills to generate electric power and toward various locations for windmills (8,9)

g. Reactions to different types of windmills in different settings, including a comparison of pairs of slides (10,11)

h. General classifying information--place and type of residence, relationship of respondent to head of household, occupation of head, size of household, age, education, income, and, by observation, sex and race (12-25)

Opinions of different types of windmills were sought by showing the respondents 14 slides in portable lighted slide viewers. These slides portrayed, in color, different windmill machines in different settings. The slides, which are pictured in Appendix A, can be described briefly, as follows:

1. String of power lines in a flat-land setting
2. String of windmills in a flat-land setting
3. Horizontal axis machine on a lattice tower in a flat-land setting
4. Darrieus (eggbeater) machine in a flat-land setting

5. Horizontal axis machine on a columnar tower in a hill setting
6. Old Dutch windmill in a hill setting
7. Horizontal axis machine on an old Dutch tower in a shore setting
8. Giromill in a shore setting
9. Horizontal axis machine on a columnar tower in a flat-land setting
10. Giromill in a flat-land setting
11. Horizontal axis machine on an old Dutch tower in a hill setting
12. Darrieus (eggbeater) machine in a hill setting
13. Horizontal axis machine on a lattice tower in a shore setting
14. Old Dutch windmill in a shore setting

It should be noted that the first slide showed power lines, for comparison with the reactions to the windmills.

These slides were presented in pairs, with the respondents being asked about their reactions first to one slide and then to the other, and then being asked which of the two they found preferable. In this way, information was obtained on preference both for a particular machine in an absolute sense and then relative to a different type of machine in the same setting.

To ascertain whether respondents were influenced by the order in which the slides were presented, three rotational patterns were used on a random systematic basis for 12 of the slides. The first two slides were always the same, namely, the flat-land scene with power lines and then a similar scene with a string of windmills. Since these scenes were meant to introduce the questions on alternative windmill machines, it was not desirable to include them in the rotation pattern. The other 12 slides were rotated in groups of four by placing two pairs of slides on each of three color-coded questionnaire forms, as follows:

A. Pink sheet--Slides 3-4 and 5-6

B. Blue sheet--Slides 7-8 and 9-10

C. Orange sheet--Slides 11-12 and 13-14

These three sheets were collated in three orders before they were included in the questionnaires, so that in each third of the questionnaires they appeared in ABC, BCA, or CAB order. While this procedure is not as rigorous as rotating every pair of slides individually and every slide within each pair, the fully rigorous procedure would have been unnecessarily complicated and, because of the relatively small sample sizes, might have been less likely to bring out order effects. Thus, this fully rigorous procedure would have involved rotating 12 sets of questions in some systematic order when the total sample size was to be only about 300.

The effect of the rotation procedure used is analyzed in Appendix D. It is sufficient to note here that evidence of order bias was found but that this rotation scheme seems to have compensated for the bias.

Other than the changes in slide order presentation, no other changes were made in the sequence of questions used, since the basic approach was to move from the general question of sources for generating electric energy to pollution-free energy to knowledge about wind and solar energy and only then to acceptance of different wind energy machines.

The Wave I questionnaire used at Sandy Hook was very similar to the main questionnaire just described, with two major differences. One was the exclusion of questions that seemed less important to the main purpose of the study, or which would be more sensitive, in view of the need to shorten the length of the interview. For these reasons, that questionnaire did not include Questions 2, 4, 6, 7, and 8 and the income question from the main questionnaire. Second, respondents were shown only four slides (3-4 and

13-14), rather than the full 14, again partly to conserve time. Also, using this approach with portable slide viewers was not easy in broad sunlight.

The questionnaire that was used in the second wave of interviewing at Sandy Hook followed a very similar pattern to that of the questionnaire for Wave I, to maximize comparability of the information. Certain changes were made, however, since some of the information obtained from the earlier questions seemed less necessary for comparative purposes. Furthermore, it was not possible to mask the purpose of the interview, since people were being questioned in full view of the windmill. Respondents were also asked about the windmill that they were looking at. As a result, the sequence of questions in the Wave II questionnaire was as follows (once again, numbers in parentheses refer to question numbers in the questionnaire, reproduced in Appendix C):

a. Use of electricity in the home (1)

b. Attitudes toward different sources for generating electricity (2)

c. Attitude toward using pollution-free energy even if cost of electricity increased (3)

d. Attitudes toward various locations for windmills (4)

e. Reactions to actual windmill at the site (5)

f. Reactions to different types of windmills in different settings, including comparison of pairs of slides, using only Slides 3-4 and 13-14 (6)

g. General classifying information--place and type of residence, relationship of respondent to head of household, occupation of head, size of household, age, education, and, by observation, sex and race (7-16)

The fourth questionnaire, the one used at Plum Brook, Ohio, was a very brief one, since the Survey Research Laboratory did not supervise the data collection and the questionnaire was self-administered. It covered the following topics (and is reproduced in Appendix C):

a. Reason for visiting the NASA machine (1)

b. Opinion on the aesthetics of the machine (2-4)

c. Choice among three designs of wind energy machines (5)

d. Attitude toward using pollution-free energy even if cost of electricity increased (6)

e. General classifying information--place and type of residence, sex, age, education, and employment status (7-11)

F. Interviewing

The interviewing on this study was carried out during the spring and summer of 1976. More specifically, the data-collection periods at each of the sites were as follows:

1. Western Michigan--June 14-August 13
2. Southeastern Wyoming--June 7-August 13
3. Western Washington--April 19-August 13
4. Eastern Rhode Island--April 28-August 13
5. Chicago metropolitan area--April 17-July 23
6. Sandy Hook Unit of Gateway National Recreation Area
    - Wave I--June 28-July 8
    - Wave II--September 18-25
7. NASA windmill, Plum Brook, Ohio--August 5-September 24

In all areas where personal interviews were conducted, interviewers were hired and trained under the direct supervision of SRL senior field staff. The exception was in the western part of the state of Washington, where the interviewing work was subcontracted to the Educational Assessment Center of the University of Washington at Seattle. No interviewers were required at the NASA site at Plum Brook, Ohio, because questionnaires were handed to visitors by the guards at the entrance gate and collected when the visitors left.

In all instances where personal interviewers were used, training was carried out on a face-to-face basis, utilizing group meetings, role playing, and practice interviews. Interviewers had to complete the required training program and do two practice interviews satisfactorily before being assigned to work on the main data-collection operation.

Altogether 50 interviewers were employed on the study, ranging from 7 for Sandy Hook, New Jersey, to 18 in Washington state.

G. Results of the Data Collection

The questionnaire used in the household interviews, and modified for the other interviews, had been refined somewhat on the basis of pretest interviews in the Chicago area and in western Michigan. These pretest interviews had shown that the questionnaire, including the use of the slides and viewers, worked very well, and only minor changes had to be made.

In the actual surveys, the household interviews using the main questionnaire went very well, but the field work took longer than expected because of the strict probability selection of the sample. Difficulty arose over interviewing a predesignated individual within each household. This meant not only that the particular household had to be contacted, but also that the interview could only be carried out when the predesignated individual was available. In the case of working adults, this often took several visits until the arrangements for the interview could be made, and in a number of instances, refusals were encountered.

A general summary of these field experiences with the main questionnaire is provided in Table 2.1. It shows, for each area of the country, what percentage of the households selected on a probability basis were interviewed and, for those not interviewed, what percentage were noncontacts and refusals.

This table shows that a total of 2,058 addresses were selected for interviewing in the five areas where household interviews were to be conducted. After elimination of vacant units and other ineligible units, 1,862 households remained, of which 1,431, or 77 percent, were interviewed. Most of the noninterviews were refusals, which varied from 5 percent in Michigan to 24 percent in the Chicago area, although a considerable number could not be contacted or were otherwise unavailable (such as on vacation).

The table shows that the response rate--the proportion of eligible households interviewed--varied appreciably by area, from 89 percent in Michigan to 66 percent in the Chicago area, again mainly because of refusals. Refusals are relatively more frequent in a major metropolitan area.

As Table 2.2 shows, the site interviews at Sandy Hook also went very well, with 87 percent of those eligible interviewed in Wave I and 90 percent in Wave II. Noncontacts were, of course, not relevant since these were samples of people already at a beach area, and refusals averaged only 10 percent.

In the case of the self-administered questionnaires at the NASA windmill site at Plum Brook, Ohio, to the best of our knowledge, no refusals were encountered. However, data collection went rather slowly because the number

TABLE 2.1

DISPOSITION OF HOUSEHOLD SURVEY SAMPLES, BY AREA

	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area	All samples
I. Total sample	414	383	417	405	439	2,058
II. Total ineligible	68	39	49	20	20	196
A. Ineligible	68	39	49	20	20	196
B. Other	--	--	--	--	--	--
III. Total eligible	346	344	368	385	419	1,862
A. Interviews	307	289	267	291	277	1,431
B. Refusals	17	32	41	59	89	238
C. Noncontacts	14	13	45	19	49	140
D. Unavailable	8	10	15	16	4	53
Response rate (IIIA÷III)	.89	.84	.73	.76	.66	.77
Refusal rate [IIIB÷(IIIA+IIIB)]	.05	.10	.13	.17	.24	.14
Eligibility rate (III÷I)	.84	.90	.88	.95	.95	.90

TABLE 2.2

DISPOSITION OF SAMPLES AT SANDY HOOK, NEW JERSEY

Category		Wave I	Wave II	Total
I.	Total sample	486	490	976
II.	Total ineligible	124	116	240
	A. Ineligible	13	3	16
	B. Other	111	113	224
III.	Total eligible	362	374	736
	A. Interviews	314	337	651
	B. Refusals	37	32	69
	C. Noncontacts	--	--	--
	D. Unavailable	11	5	16
Response rate (IIIA÷III)		.87	.90	.88
Refusal rate [IIIB÷(IIIA+IIIB)]		.11	.09	.10
Eligibility rate (III÷I)		.74	.76	.75

of visitors was smaller than anticipated. As a result, only 154 questionnaires were collected during the five weeks that they were handed out.

A discussion of the general background information on the respondents to the five household surveys and to the two waves of Sandy Hook interviews is presented in Appendix E. Also included there is a section on the extent to which these people make use of electricity in their homes. The characteristics of the Plum Brook respondents are discussed in Chapter VI.

H. Data Processing

For purposes of both efficiency and economy, all the questionnaires were precoded, as is shown in the copies in Appendix C. This facilitated the coding of the data and their transference to magnetic tape, all of which was done at the Urbana office of the Survey Research Laboratory. In addition, check coding was used to catch coding errors. The data were also machine-cleaned for illegal punches and inconsistent answers. The resulting data set was then put on magnetic tape and was used as a basis for the analysis.

III. GENERAL FINDINGS ON ENERGY AND THE ENVIRONMENT

Three different aspects of people's attitudes toward the energy situation are covered in this chapter based on the survey results: the desirability of utilizing alternative energy sources for the production of electric power, attitudes toward different policy alternatives on securing energy, and sensitivity toward the country using sources of electric power that cause less pollution even if it meant an increase in the cost of electricity.

The data presented in this chapter are based primarily on the responses obtained from the use of the main questionnaire as described in the preceding chapter and reproduced in Appendix C. When the same questions were part of the Wave I interview at Sandy Hook, New Jersey, before the windmill was constructed, responses obtained in those interviews are also presented. Data from the Wave II interviews at Sandy Hook or from the self-administered questionnaires at Plum Brook are not included.

It should be stressed that the aggregated figures for "all samples" shown in the tables throughout this report are unweighted and are not total estimates for the U.S. population, since the areas sampled were selected not on a probability basis but rather to fit the purposes of this particular study. These totals are presented to give an indication of the average over all areas and to provide a rough yardstick of the extent to which each particular area deviated from the average for the combined samples.

A. Preference for Electric Energy Sources

In response to a question on which sources the sample members thought should be used to produce our electricity, opinions varied widely. As can be seen from Table 3.1, solar energy and hydroelectricity received the greatest percentage of affirmative answers, with approximately 90 percent or more of the respondents in each geographic area approving of each of these sources. A large majority of respondents in each area also favored the use of wind energy from windmills. Support for this source varied from 76 percent in the Chicago area to 93 percent in southeastern Wyoming.

Somewhat less enthusiasm was shown for nuclear energy (favored by roughly 60 to 70 percent of the respondents) and for deep-shaft coal mining (approximately 50 to 70 percent). Strip-mining of coal received its greatest support from sample members in Wyoming (64 percent); in the other five locations, most of the respondents disapproved of the use of this energy source.

The least popular sources were natural gas and oil. Particularly negative were the respondents in southeastern Wyoming and western Washington, with only about 30 percent in each of these areas approving the use of natural gas and oil. There was, however, considerable regional variation in the responses regarding these sources. For example, twice as many respondents in eastern Rhode Island (60 percent) as in western Washington (30 percent) favored the use of oil for generating electricity.

Some very interesting patterns emerge when we relate the preferences among the various electric energy sources to the socio-demographic characteristics of the respondents. For example, support for use of solar energy, wind energy, and nuclear energy to produce electricity rose noticeably with the level of formal education of the respondent, whereas support for use of

TABLE 3.1

PREFERENCE FOR PARTICULAR SOURCES FOR PRODUCTION OF ELECTRICITY, BY AREA

(Percent Responding "Yes" to Each Source)

Source	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area	Sandy Hook, New Jersey[a]	All samples[b]
Solar energy from the sun	92	97	96	92	94	96	94
Hydroelectricity from dams	95	95	95	89	90	91	92
Wind energy from windmills	91	93	82	81	76	88	85
Nuclear energy	60	71	59	59	59	70	63
Coal from deep-shaft mining	52	68	53	52	49	52	54
Coal from strip-mining	36	64	46	40	44	39	45
Oil from wells	36	31	30	60	33	40	38
Natural gas	31	30	28	45	48	46	38
Base (range)[c]	(238-291)	(262-282)	(233-260)	(226-284)	(218-246)	(260-308)	(1,480-1,653)

[a] In this and subsequent tables in this chapter, the Sandy Hook figures are based on data obtained in the Wave I interviews at that site before construction of the windmill.

[b] Throughout this report, the "all samples" figures represent unweighted summations of the number of interviews in the different areas; they are not weighted by the population sizes of those areas.

[c] Base varies because of differing number of "No answers" for each source.

natural gas and oil tended to decline with education. In the Wyoming and Washington samples, the proportion of those with at least some college education who favored use of solar energy was as high as 98 percent (see Table F.1 in Appendix F). To take another example, the proportion of the Chicago sample who advocated the use of nuclear energy rose from 45 percent of those with some high school education or less to 66 percent of those with some college education.

Rather surprisingly, similar patterns are not evident when these responses are analyzed by occupation. There was apparently a slight tendency for a higher proportion of those in professional or managerial occupations to prefer solar energy (and also the two forms of coal mining), but no clear preference is evident in the case of nuclear power or wind energy (see Table F.2 in Appendix F).

The electric energy source preferences show marked differences by sex and race. More females than males favored the use of oil, whereas a much higher proportion of males than of females supported the use of nuclear energy. Also more popular among females than males was the use of natural gas for the production of electricity. This was particularly noticeable in the Chicago area and in eastern Rhode Island. In the former sample, for example, 63 percent of the females but only 35 percent of the males favored this source.

Racial differences in energy source preferences emerge in the Chicago area, the only sample to have an appreciable number of nonwhites. A much larger proportion of nonwhites than of whites supported the use of natural gas and oil for generating electricity. The margin was 70 to 42 percent, for example, in the case of natural gas. Also, whites much more than nonwhites favored the use of deep-shaft coal and solar, nuclear, and wind energy.

Older people were generally much more inclined than younger people to support the use of nuclear energy and both types of mined coal. Taking the Sandy Hook sample as an example, 86 percent of those 60 years of age or older favored the use of deep-shaft coal, compared with only 36 percent of those under 30 years of age.

Income differences also show up, especially with regard to use of solar energy, nuclear energy, and deep-shaft coal. In all three cases, support for that particular energy source rose with income level, going up to 100 percent for solar energy among those earning $20,000 or over in the Michigan and Wyoming samples (see Table F.1).

How does the general public perceive the pros and cons of different electric energy sources? To obtain information on this question, people who favored a particular energy source were asked to indicate what they felt to be the advantages of that source, and those who did not favor a source were asked to give the disadvantages of that source. The relative frequency of these answers is shown in Table 3.2 for all samples combined, with the exception of Sandy Hook, New Jersey, where this question was not asked. The frequencies are combined for the different samples partly because of the complexity that would be involved in showing the data for each sample separately and partly because the basic results are very similar among the different samples.

The bases for the percentages in the "advantages" section of Table 3.2 are all those respondents (excluding those at Sandy Hook) favoring the use of that particular energy source. Similarly, the bases for the percentages in the "disadvantages" section are those *not* favoring the use of that particular energy source. Respondents were given the opportunity to cite as many

TABLE 3.2

ADVANTAGES AND DISADVANTAGES OF EACH ELECTRIC ENERGY SOURCE[a]

(Percent Mentioning Each Advantage or Disadvantage)

Response	Solar energy	Hydro-electricity	Wind energy	Nuclear energy	Coal		Oil	Natural gas
					Deep-shaft	Strip-mined		
				Advantages[b]				
Large supplies	41	34	35	24	45	46	44	29
Low cost	23	21	27	17	12	18	6	13
Nonpolluting	17	18	17	11	6	2	4	17
Natural source	11	10	11	*	3	2	2	4
Saves natural resources	9	11	8	8	10	1	1	1
Safe	4	4	4	6	1	3	1	2
Other	13	15	15	24	18	18	24	15
Base	(1,560)	(1,519)	(1,379)	(953)	(827)	(694)	(593)	(559)
				Disadvantages[c]				
Limited supplies	29	23	31	2	17	11	53	57
High cost	13	16	8	8	10	6	19	17
Polluting	-	15	1	14	23	57	11	4
Wastes natural resources	-	9	-	1	7	32	11	10
Unsafe	2	4	1	58	38	5	1	5
Other	39	14	46	13	8	7	15	14
Base	(93)	(125)	(235)	(552)	(692)	(848)	(953)	(921)

[a] Not asked at Sandy Hook, New Jersey.

[b] Asked only of those respondents who favored use of particular source.

[c] Asked only of those respondents who did not favor use of particular source.

*Less than 0.5 percent.

as three advantages or disadvantages per source, depending on whether they approved or disapproved of the source.

As might be expected, the specific frequencies of different advantages and disadvantages vary by energy source. Solar and wind energy were favorably regarded primarily because of the very promising supply situation and also because of the felt likelihood of low cost. Various advantages of an environmental nature were also frequently mentioned: these sources are non-lluting, they conserve natural resources, and they are natural sources for lectric power. The relatively numerous "other" advantages for these types of energy sources represent a wide variety of answers, such as the following:

Best source we can count on.

Could be perpetual.

Don't have to contend with ruining the earth.

Can build anywhere.

Wouldn't be so dependent on the power companies.

There were also several references to the independence that these energy sources would give the country from reliance on overseas oil. It is interesting to note that in the case of windmills, a few comments were made that this source would not provide visual pollution.

The advantages cited for hydroelectric power follow a distribution very similar to that for solar and wind energy. The "other" advantages for hydro power were also similar to those for solar and wind energy but with even more emphasis on the perpetuity and reliability of this source. Also mentioned were the recreational possibilities created by the existence of dams.

Among those favoring nuclear energy, large supplies and low cost were not cited as often as with some of the other sources. Many of the advantages mentioned were of the "other" variety, relating mostly to the renewability of this energy source, to the fact that we would not have to rely on foreign sources, and to its increased feasibility in the light of modern technology.

The existence of large supplies was also the most frequently mentioned advantage of coal, oil, and natural gas, with low cost being the next most frequent advantage cited for strip-mined coal. However, both types of coal (but especially strip-mined coal) were felt by many respondents to have the disadvantage of being polluting, and deep-shaft coal mining was thought to be unsafe.

For the other energy sources, frequently cited disadvantages were limited supplies in the case of natural gas and oil and lack of safety in the case of nuclear energy. For solar and wind energy, the single most frequently mentioned disadvantage was limited supplies; there was also a relatively large number of miscellaneous disadvantages mentioned for wind energy. These included comments such as the following:

> Not practical having windmills all over.
>
> Windmills are for farms.
>
> Too insecure.
>
> High winds would knock it down.
>
> Can't store AC current.
>
> Too much maintenance.
>
> Ruins the scenery.
>
> Windmills would have to be huge.
>
> Need to develop better storage batteries.

Skepticism about the practicality of this source seemed to be the most frequent miscellaneous comment, supplemented by reservations on the maintenance aspects and on possible visual pollution.

From Table 3.2 it is obvious that different people hold contradictory opinions about the supply, cost, safety, polluting qualities, etc., of the various sources for generating electricity. For example, almost as high a percentage of respondents felt that potential supplies of solar and wind energy are limited as felt that such supplies are large. And a substantial number of respondents mistakenly believed that solar and wind energy are low-cost sources. It should be stressed that no attempt was made to ascertain the accuracy of respondents' impressions or the intensity of their convictions.

Table 3.3 indicates how many advantages (or disadvantages) were mentioned on the average by those favoring (or not favoring) particular energy sources, by geographic area. For example, only half of those in the Chicago area who disapproved of the use of hydroelectric power gave any reasons for their feelings, whereas those in southeastern Wyoming who shared those feelings provided an average of 1.40 reasons.

Although there are absolute differences among regions, the relative rankings of number of comments per source are, on the whole, very similar. The largest number of advantages were provided for solar, wind, and hydroelectric energy, and the smallest number for oil. When it came to specifying disadvantages of the various energy sources, respondents had the most to say about strip-mined coal, followed by oil, deep-shaft coal, and natural gas. The fewest disadvantages were mentioned for solar and wind energy.

We can compute what might be called an "index of acceptability" by taking the ratio of the favorable comments to the sum of the favorable and

TABLE 3.3

NUMBER OF ADVANTAGES OR DISADVANTAGES MENTIONED PER RESPONDENT FOR EACH ELECTRIC ENERGY SOURCE, BY AREA

Source	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area	All samples[a]
			Advantages[b]			
Solar energy	1.32	1.43	1.41	1.78	1.28	1.45
Hydroelectricity	1.30	1.36	1.43	1.56	1.19	1.37
Wind energy	1.34	1.42	1.51	1.74	1.20	1.45
Nuclear energy	1.07	1.00	1.21	1.48	1.05	1.16
Deep-shaft coal	1.04	1.10	1.08	1.43	1.04	1.14
Strip-mined coal	.95	1.10	1.20	1.20	.95	1.09
Oil	.79	.76	.96	1.03	.79	.89
Natural gas	.99	.88	1.05	1.21	1.00	1.03
			Disadvantages[c]			
Solar energy	.91	.56	1.09	1.17	.75	.94
Hydroelectricity	1.07	1.40	1.23	1.06	.50	1.00
Wind energy	1.16	.95	1.13	1.08	.89	1.03
Nuclear energy	1.13	1.17	1.26	1.25	.98	1.16
Deep-shaft coal	1.28	1.36	1.32	1.40	1.09	1.28
Strip-mined coal	1.50	1.65	1.39	1.63	1.21	1.48
Oil	1.31	1.38	1.33	1.58	1.10	1.32
Natural gas	1.22	1.39	1.31	1.31	1.08	1.27

[a] Except Sandy Hook, New Jersey.

[b] Includes only respondents favoring each particular source.

[c] Includes only respondents not favoring each particular source.

unfavorable comments for each energy source and each sample. Such a ratio shows the extent to which a particular energy source was regarded favorably, at least among those respondents who knew enough to give reasons why they favored or did not favor that source. This index could theoretically vary from 0 (no favorable comments) to 1.00 (nothing but favorable comments).

The results, shown in Table 3.4, highlight the far greater support for solar and wind energy and for hydroelectric power than for any of the other sources. The index numbers for solar energy and for hydroelectricity are near the top of the scale and indicate nearly unanimous support for those energy sources.

On the other hand, strip-mined coal, oil, and natural gas have very low acceptability ratings, well under .50 in most regions. Deep-shaft coal and nuclear energy seem to be in the middle range in terms of this index. Nuclear energy receives a slightly higher index rating than deep-shaft coal, with the index ranging generally around .6.

Variations by area are not especially strong, although the people in the Wyoming sample tended to find coal and nuclear energy more acceptable than did those in the other four areas where this question was asked, whereas respondents in the Chicago sample tended to be slightly less favorable toward wind energy.

When respondents in all six areas were asked which *one* source of the eight listed should be used the *most*, solar energy had the highest frequency of mentions in four areas, and hydroelectricity had the highest in the other two areas, western Michigan and western Washington. As can be seen from Table 3.5, solar energy was by far the preferred source for electricity production, especially if the replies favoring wind energy are combined with those favoring solar energy.

TABLE 3.4

INDEX OF ACCEPTABILITY OF PARTICULAR ELECTRIC ENERGY SOURCES, BY AREA[a]

Source	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area	All samples[b]
Solar energy	.94	.99	.97	.94	.96	.96
Hydroelectricity	.96	.95	.96	.92	.96	.95
Wind energy	.92	.95	.86	.88	.81	.89
Nuclear energy	.59	.68	.58	.63	.60	.62
Deep-shaft coal	.46	.63	.48	.52	.48	.52
Strip-mined coal	.27	.54	.42	.33	.38	.39
Oil	.25	.20	.24	.49	.26	.29
Natural gas	.27	.22	.24	.43	.46	.31

[a] Index is defined as: $\frac{\text{Favorable comments}}{\text{Favorable comments + Unfavorable comments}}$.

[b] Except Sandy Hook, New Jersey.

TABLE 3.5

RELATIVE FREQUENCY OF PREFERENCE FOR EACH ELECTRIC ENERGY SOURCE, BY AREA

(Percent Naming Each Source as the One That "Should Be Used the Most")

Source	Western Michigan	Southeastern Wyoming	Western Washington	Chicago area	Eastern Rhode Island	Sandy Hook, New Jersey	All samples
Solar energy	29	34	31	38	44	47	37
Hydroelectricity	36	25	45	20	13	13	25
Wind energy	15	14	5	7	9	8	10
Nuclear energy	9	11	14	12	13	18	13
Deep-shaft coal	2	3	*	4	6	1	3
Strip-mined coal	2	8	2	3	3	2	3
Oil	1	2	1	2	6	2	2
Natural gas	5	3	2	15	6	8	6
Total	99[a]	100	100	101[a]	100	99[a]	99[a]
Base	(299)	(268)	(259)	(240)	(263)	(309)	(1,638)

[a] Not 100 percent because of rounding.

* Less than 0.5 percent.

Nuclear energy received much less frequent mention as the one source to be used the most, varying from 9 percent in western Michigan to 18 percent in Sandy Hook, New Jersey.

To some extent, the variations in preferences can be explained by the respondents' knowledge of and familiarity with the various sources. Thus, hydroelectric power, which is already a major source of electricity in the state of Washington, was the preferred source there. Similarly, in western Michigan, where the possibility of obtaining electricity from windmill power has received a lot of publicity, a higher proportion of respondents than in the other samples favored the use of wind energy.

It is interesting to note that, despite its abundance in this country, coal received very little support as a preferred source for producing our electricity. This was true even in the Chicago area, which is a center for coal transportation and located in one of the leading coal-producing states in the country. It is likely that the great amount of negative publicity given to coal as a source of pollution had some influence on these responses.

Pronounced differences in preferences for the energy source to be used the most are evident by education, age, sex, race, and income level of the respondents. There was a strong tendency among those with some high school education or less to choose gas, oil, or hydroelectric power, whereas those with some college education more often chose solar energy. Solar energy was also much more frequently favored by younger people, whereas older people were more likely to prefer some form of coal mining.

In the Chicago area, solar energy, hydroelectricity, and nuclear energy were much more popular among whites than among nonwhites, whereas gas and oil were favored more by the nonwhites.

Males tended to prefer coal and nuclear energy, while females more frequently chose natural gas, oil, and wind energy. Those at higher income levels more frequently favored solar and nuclear energy; people at the lower income levels tended more often to choose natural gas or oil as the source that should be used the most.

Undoubtedly, these differences are interrelated: younger people, for example, tend to be better educated than older people. Hence, the extent to which the various socio-demographic variables account for these differences can only be ascertained by more complex analyses, which are presented in Chapter VII. Nevertheless, the principal findings are clear--certain electric energy sources are much more preferred than others, these preferences differ considerably by socio-demographic characteristics, and people may have preferences for very different, and even conflicting, reasons.

B. Alternative Energy Policies

Respondents in the household surveys were asked if they agreed or disagreed with three statements on different policy alternatives for providing energy. These statements were the following:

1. The U.S. should produce as much energy as possible and import from other countries whatever else is needed.
2. The U.S. should produce as much energy as possible but *limit usage* so that little need be imported.
3. The U.S. should ration energy usage so that none need be imported.

Respondents were asked to indicate their agreement or disagreement with each of these options on a four-point scale, ranging from "strongly agree" to "strongly disagree." The extent to which they agreed or strongly agreed with each of these policy alternatives, by area, is shown in Table 3.6. For example, the figure for western Michigan in the first row indicates that 79 percent of that sample either agreed or strongly agreed with the alternative that U.S. energy production should be maximized and that any additional energy needs should be met by imports. It should be stressed that the percentages in a particular column are not additive because respondents were free to agree or disagree with each alternative separately.

The principal finding evident from Table 3.6 is that approximately three-quarters of those interviewed felt that the U.S. should maximize energy production and then either import the rest or limit usage to reduce imports. Rationing energy to eliminate imports altogether was apparently quite unpopular, with only a fourth of the respondents agreeing with this policy.

Variations in these attitudes by area are relatively small. No particular pattern seems to exist, although two regional differences do emerge. The completely unrestricted policy of providing all the energy needed received less support in the Chicago area than it did in western Michigan, where respondents were more likely to favor this policy than the other two and were less likely than respondents in any other region sampled to favor rationing of energy use.

Variations are evident, however, for some of the socio-demographic characteristics of the respondents (see Tables F.4, F.5, and F.6 in Appendix F). Thus, the proportion of those favoring an energy policy of maximizing domestic production and limiting usage tended to decline as education rose. In the Washington sample, for example, the proportion agreeing with this policy varied from 80 percent of those having some high school education or less to 66 percent of those with at least some college education.

TABLE 3.6

APPROVAL OF PARTICULAR ENERGY POLICY ALTERNATIVES, BY AREA

(Percent "Strongly Agree" or "Agree" with Each Policy)

Policy	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area	All samples[a]
Maximize U.S. production, import rest	79	75	76	79	67	75
Maximize U.S. production, limit usage	78	78	72	79	77	77
Ration energy usage, import none	20	23	27	29	26	25
Base (range)[b]	(302-304)	(282-289)	(260-263)	(282-285)	(264-266)	(1,392-1,404)

[a] Except Sandy Hook, New Jersey, where this question was not asked.

[b] Base varies because of differing number of "No answers" for each policy alternative.

Also, in all samples except Washington, the proportion in favor of rationing energy supplies tended to decline as the level of education increased. In Michigan, for example, the proportion favoring this policy varied from 33 percent of those with some high school education or less to only 12 percent of those with at least some college education.

Rationing of energy received markedly less support with higher levels of income. Thus, in Washington, 32 percent of those earning under $7,000 favored this policy, compared with only 14 percent of those earning $20,000 or over.

In all samples, more females than males agreed with the option of maximizing domestic production of energy but limiting its usage. In western Michigan, for example, 84 percent of the females but only 72 percent of the males approved of this policy. On the other hand, overall there was little variation by age or occupation in the proportion agreeing with any of these three energy policies. The exceptions were a slight tendency for those 60 and over to view energy rationing more favorably than those in other age groups and for a smaller proportion of those in professional or managerial occupations to favor that policy.

The respondents' preferences among the three alternative energy policies become clearer when we look at Table 3.7, which tabulates the responses obtained when the respondents were asked which of the options they thought was the "best." Since each respondent had to select *one* alternative, the percentages in each column add to 100 percent. As is evident from this table, the policy of maximizing domestic production of energy but limiting usage received the most support, with more than half the sample members in each of the five areas selecting this option. It received substantially greater support in each area than did the option of meeting all energy needs regardless of the amount that would have to be imported.

Table 3.7 also highlights the widespread unpopularity of a policy combining energy rationing with the elimination of imports. It seems clear from these data that there would be little public support for such a policy (only about one in ten respondents favored it), but that there would be a willingness to accept some limit on energy usage combined with maximum domestic production as a means of reducing our dependence on foreign supplies.

Appreciable differences are evident when we relate the preferences among these policy alternatives to the socio-demographic characteristics of the respondents (see Table F.7 in Appendix F). Thus, there was a tendency for those in professional and managerial occupations to be more favorable than other occupational groups toward maximizing energy production and importing whatever else is needed. Furthermore, as education increased, the proportion in favor of rationing tended to decline and the proportion in favor of maximum production with importation of the rest tended to rise. As a result, it is not surprising to find also that in general the proportion in favor of rationing fell with income level, while the proportion favoring maximum domestic production with importation rose with income level. In Wyoming, for example, among those earning under $7,000 a year, 12 percent preferred rationing and 21 percent preferred maximizing production and importing the rest, while the corresponding figures for those earning $20,000 or over were 2 and 46 percent, respectively.

One other difference is that more females than males selected as best the policy of maximizing U.S. production and limiting usage.

TABLE 3.7

RELATIVE FREQUENCY OF PREFERENCE FOR EACH ENERGY POLICY ALTERNATIVE, BY AREA

(Percent Naming Each Alternative as the "Best")

Policy	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area	All samples[a]
Maximize U.S. production, import rest	40	31	36	35	36	35
Maximize U.S. production, limit usage	52	59	51	55	52	54
Ration energy usage, import none	8	10	13	11	12	11
Total	100	100	100	101[b]	100	100
Base	(303)	(286)	(261)	(284)	(269)	(1,403)

[a] Except Sandy Hook, New Jersey, where this question was not asked.

[b] Not 100 percent because of rounding.

In summary, people seem quite supportive of a policy that would try to impose some sort of limit on energy use, particularly if it were coupled with a program to reduce our dependence on imports from other countries. Under current conditions, however, a policy of rationing energy usage would be likely to meet with considerable resistance.

C. Paying Extra for Pollution-Free Energy

While everybody seems to favor pollution-free energy, would they still favor this type of energy if they had to pay more money for it? To learn the answer to this question, respondents in all six sampling areas were asked successively whether they would favor using pollution-free sources if the cost of electricity went up 10 percent, 25 percent, or 50 percent.[1]

The results, shown in Table 3.8, suggest that a substantial proportion of the population would be in favor of paying 10 percent more, over a third would pay 25 percent more, and a small proportion would pay even 50 percent more. To be more specific, nearly three-quarters of the combined samples would pay 10 percent more for pollution-free energy, with the percentage rising to over 80 percent in the rural areas of western Washington and southeastern Wyoming. Almost two-fifths of the combined samples would pay up to 25 percent more, except in western Michigan and eastern Rhode Island, where slightly less than one-third would do so. Again, those in the rural areas of western Washington and southeastern Wyoming would be more in favor of paying this increase than would respondents in the other areas sampled.

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[1] Those respondents who responded "No" to a specific percentage increase where not asked about a higher increase; it was assumed that their answers would be negative.

TABLE 3.8

SENSITIVITY TO INCREASES IN COST OF ELECTRICITY TO PAY FOR POLLUTION-FREE ENERGY, BY AREA

(Percent Responding "Yes" to Each Increase)

Cost increase	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area	Sandy Hook, New Jersey	All samples
10%	66	81	84	61	68	77	73
25%	32	45	53	31	36	40	39
50%	9	25	26	16	10	17	17

When a possible price increase of 50 percent was suggested, about 25 percent of the sample members in southeastern Wyoming and western Washington still favored using pollution-free energy, although in the Chicago area and in nearby western Michigan, the figure was only about 10 percent.

Price sensitivity varied appreciably by the socio-demographic characteristics of the respondents (see Table F.8 in Appendix F). Thus, a much higher proportion of those with at least some college education than of others were in favor of paying 10 percent or 25 percent more for pollution-free energy. In the Rhode Island sample, for example, only 43 percent of those with some high school education or less favored paying 10 percent more for pollution-free energy, compared with 75 percent of those with at least some college education.

In general, favorable attitudes toward paying more for pollution-free energy were more frequent among professional and white-collar people. In addition, these attitudes rose with income level. In the Chicago area, for example, 81 percent of those earning over $20,000 per year said that they would pay 10 percent extra for pollution-free energy, compared with only 54 percent of those earning less than $7,000 per year.

The relation between income level and favorable attitudes toward the higher costs of pollution-free energy may explain why, in the Chicago area, 74 percent of the white but only 45 percent of the nonwhite respondents were in favor of paying 10 percent more. In addition, this relationship no doubt has a bearing on the fact that increased electricity costs found less support among the older respondents, particularly those 60 or over.

While these questions were, of course, hypothetical, the data collected can provide strong indications of future actual behavior under those conditions. In the present case, the results suggest that the demand for pollution-free energy is very strong among substantial proportions of the population. Certainly, a price increase of 10 percent in exchange for pollution-free energy would undoubtedly be accepted, especially with dissemination of appropriate supporting information. It is also not unlikely that a price increase of up to 25 percent could receive considerable support, although a more substantial price increase would no doubt encounter major problems.

IV. OVERALL REACTIONS TO WINDMILLS

This chapter focuses on people's familiarity with solar and wind energy, their attitudes toward the idea of using windmills to generate electric power, and their reactions to various possible locations for windmills. As in the preceding chapter, the discussion is based primarily on responses obtained in the five household surveys, with data from the first wave of interviewing at Sandy Hook, New Jersey, where applicable. We begin with some general information on knowledge about solar and wind energy, followed by presentation of the results on reactions to the idea of windmills and to different windmill locations.

A. Knowledge of Solar and Wind Energy

As can be seen in the first column of Table 4.1, approximately three-fourths of the sample members in the five areas where this question was asked had heard something about solar energy as a source of electricity, with the percentages being higher outside of the midwestern areas of western Michigan and Chicago.

Knowledge about wind energy (as distinct from solar energy) was much less widespread and much more variable. Table 4.1 shows that nearly 70 percent of the respondents in western Michigan had heard something about wind energy, compared with roughly 50 to 60 percent of those in southeastern Wyoming, western Washington, and eastern Rhode Island and with only 36 percent in the Chicago area. The very high proportion in western Michigan with such knowledge is undoubtedly due to the widespread publicity in that

TABLE 4.1

KNOWLEDGE OF SOLAR AND WIND ENERGY AS SOURCES OF ELECTRICITY, BY AREA

(Percent Having Heard Anything About Source)

Area	Solar energy	Wind energy
Western Michigan	70	36
Southeastern Wyoming	80	62
Western Washington	78	54
Eastern Rhode Island	86	63
Chicago area	70	36
All samples[a]	77	57

[a] Except Sandy Hook, New Jersey, where this question was not asked.

area about the possible installation of a wind energy machine on the shores of Lake Michigan to provide extra power. In contrast, there seems to have been very little publicity on wind energy machines in the Chicago area.

When we relate familiarity with solar and wind energy to the socio-demographic characteristics of the respondents, some differences are apparent. (See Tables F.9 and F.10 in Appendix F.) Thus, those with at least some college education were much more likely than other people to have heard about solar and wind energy. In the Rhode Island sample, 98 percent of those with at least some college education reported having heard of solar energy, compared with 67 percent of those with some high school education or less.

There was also a tendency for knowledge of solar energy to rise sharply with income level, but this was not true of wind energy. On the other hand, knowledge of both solar and wind energy was reported more frequently by male than by female respondents and by those in white-collar occupations more than those in other occupational groups.

Older people (those 60 or over) were more likely than other age groups to report having heard of wind energy, but they were least likely to have heard of solar energy.

It should be stressed that no attempt was made to obtain details on what information respondents had on wind energy or how accurately they understood the facts about wind or solar energy.

B. Electricity from Wind Energy?

Except for those in the Chicago area, respondents were generally positive toward the idea of using windmills to generate electric power. This query was used in the household surveys as an introduction to the specific questions on windmills. As is evident from Table 4.2, much more frequent favorable reactions were expressed by members of the western Michigan and southeastern Wyoming samples, with less positive reactions in western Washington and eastern Rhode Island, and the least positive reactions in the metropolitan area of Chicago. More specifically, in western Michigan, 76 percent of the sample members thought that the use of windmills for electricity was a good idea, but only 48 percent of the members of the Chicago sample gave a similar response.

The sharp variation in the frequency of "don't know" answers is also meaningful in this respect. In general, people who give this response are not favorable on a particular issue. Note that the highest frequency of such responses, 12 percent, occurred in the Chicago area, with the lowest frequencies occurring in western Michigan, southeastern Wyoming, and western Washington. The fact that this response was most frequent in the Chicago area is another indication of the rather negative reactions that a substantial proportion, possibly a majority, of the people in the Chicago metropolitan area have toward the use of windmills to generate electric power, something that is not true of the other four areas in which this question was asked.

One reason for the different results obtained in the Chicago area may be the strongly negative attitude toward the use of windmills that was held by nonwhites, a group heavily represented in the Chicago sample only. Nearly twice as many nonwhites as whites felt that using windmills for electric energy was a poor idea--38 versus 19 percent, respectively.

Another socioeconomic pattern evident in the samples, but not especially pronounced, was a tendency for those who felt that using windmills for electricity was a good idea to be better educated (see Table F.11 in

TABLE 4.2

ATTITUDE TOWARD IDEA OF USING WINDMILLS TO GENERATE ELECTRIC POWER, BY AREA

(Percent Giving Each Response)

Response	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area	All samples[a]
Good	76	70	60	58	48	62
Fair	13	22	26	23	23	21
Poor	6	7	13	13	17	11
Don't know	5	2	2	6	12	6
Total	100	101[b]	101[b]	100	100	100
Base	(307)	(289)	(267)	(290)	(276)	(1,429)

[a] Except Sandy Hook, New Jersey, where this question was not asked.

[b] Not 100 percent because of rounding.

Appendix F). There was also some tendency for younger people in the western Washington sample to be more favorable than older people toward the use of windmills for generating electric power.

C. Alternative Locations for Windmills

In order to measure reactions to possible types of sites for windmills, the respondents were asked whether they would approve, disapprove, or not care if windmills were placed in five alternative locations. The data in Table 4.3 indicate what percentage of each of the samples would *disapprove* of locating windmills in these five different types of places. For example, of those interviewed in western Michigan, 9 percent said that they would disapprove of locating windmills along rural roads, 13 percent would disapprove of locating them along interstate highways, etc.

The only appreciable objection would seem to be to windmills placed along shore lines. Thus, as is evident from Table 4.3, approximately one-fourth or more of the sample members in southeastern Wyoming, western Washington, eastern Rhode Island, and the Chicago area would disapprove of locating windmills along shore lines.

There is apparently less opposition to the possibility of locating windmills along interstate highways or on hills or mountains, with the least opposition being to windmills along rural roads and in open fields. It is rather interesting to note that in four of the six sample areas, there would seem to be greater objection to locating windmills along interstate highways than on hills or mountains. The greatest objection to the latter location was in the Chicago area, which is largely devoid of that type of scenery. Note, however, that a large proportion of the Chicago sample would also disapprove of locating windmills along shore lines, which may reflect their concern over further cluttering of the Lake Michigan shore.

TABLE 4.3

DISAPPROVAL OF SPECIFIC LOCATIONS FOR WINDMILLS, BY AREA

(Percent Who Would Disapprove of Each Location)

Location	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area	Sandy Hook, New Jersey[a]	All samples
Along roads in rural areas	9	12	13	12	11	9	11
Along interstate highways	13	20	21	21	16	11	17
In open fields	8	14	10	6	10	6	9
On the slopes of hills or mountains	8	18	12	17	20	13	15
Along the shores of lakes or oceans	17	31	25	29	26	18	24
Base (range)[b]	(303-305)	(287-288)	(246-266)	(288-290)	(275-276)	(309-312)	(1,732-1,736)

[a] These figures are based on data obtained in the Wave I interviews at Sandy Hook before construction of the windmill.

[b] Base varies because of differing number of "No answers" for each location.

A major determinant of people's willingness to tolerate windmills in particular locations was their answer to the question considered previously, namely, how they felt about the idea of using windmills to generate electric power. Those who felt that the use of windmills for this purpose was a poor idea were far more likely to disapprove of locating windmills at just about any site, whereas those who felt that it was a good idea to use windmills for generating electricity were much less likely to object to locating windmills in specific sites.

This pattern is brought out in Table 4.4, which shows what percentage of each sample having a particular attitude on the use of windmills for electricity disapproved of the specified locations. For example, the first row of the table tells us that 6 percent of those in the Michigan sample who felt that using windmills for electricity was a good idea disapproved of locating them along rural roads; 18 percent of those in the Michigan sample who thought that using windmills for electricity was a fair idea disapproved of this location. However, of those Michigan respondents who felt that using windmills for electricity was a poor idea, the percentage disapproving of their location along rural roads rises to 22 percent. The final figure in that row, 9 percent, shows the frequency with which all members of the Michigan sample disapproved of locating windmills along rural roads.

As is evident from this table, the proportion of sample members who disapproved of putting windmills in a particular location tends to be sharply higher as one moves from those who felt that the use of windmills for electricity was a good idea to those who felt it was a poor idea. This is true for all five types of locations, although the extent of the difference varies sharply by area. In particular, the frequency of disapprovals in the western Michigan sample is more often lower among those who felt that using windmills

TABLE 4.4

DISAPPROVAL OF SPECIFIC LOCATIONS FOR WINDMILLS BY ATTITUDE TOWARD IDEA OF USING WINDMILLS TO GENERATE ELECTRIC POWER, BY AREA

(Percent Who Would Disapprove of Each Location)

Location	Area	Attitude toward use of windmills for electric power			
		Good	Fair	Poor	All respondents
Rural roads	Western Michigan	6	18	22	9
	Southeastern Wyoming	10	7	30	10
	Western Washington	9	17	26	14
	Eastern Rhode Island	6	17	27	12
	Chicago area	8	6	28	12
	All samples[a]	8	12	27	11
Interstate highways	Western Michigan	9	25	28	12
	Southeastern Wyoming	15	28	40	20
	Western Washington	11	34	49	22
	Eastern Rhode Island	13	29	40	20
	Chicago area	11	13	30	15
	All samples[a]	12	26	38	18
Open fields	Western Michigan	7	12	6	8
	Southeastern Wyoming	13	8	40	14
	Western Washington	6	9	34	10
	Eastern Rhode Island	4	4	11	5
	Chicago area	6	10	19	10
	All samples[a]	7	8	22	9
Hills or mountains	Western Michigan	5	20	11	7
	Southeastern Wyoming	19	10	30	18
	Western Washington	7	16	31	13
	Eastern Rhode Island	11	26	30	17
	Chicago area	17	22	32	21
	All samples[a]	11	19	29	15
Shore lines	Western Michigan	14	30	22	17
	Southeastern Wyoming	27	30	55	30
	Western Washington	20	29	43	25
	Eastern Rhode Island	20	42	49	29
	Chicago area	21	25	40	26
	All samples[a]	20	31	43	25

[a] Except Sandy Hook, New Jersey, where question on attitude toward using windmills was not asked.

for electricity was a poor idea than among those who felt it to be a fair idea. This may reflect the widespread discussion about using windmills for electricity in that area, which is quite hilly with many open fields. Also, because the residents of the area seem strongly in favor of windmills, the sample size for the "poor idea" group was quite small, 18, so that these percentages are subject to larger sampling errors than other figures in the table.

In the other four samples where the question on windmill use was asked, the frequency of disapprovals tends to increase sharply from the groups who felt that using windmills for electricity was a good idea to those who though it was a poor idea. The "spread" is particularly pronounced for the Wyoming, Washington, and Rhode Island samples. Thus, in western Washington, the percentage disapproving of locating windmills along interstate highways varied from 11 percent of those who thought that windmills for electricity was a good idea to 49 percent of those who felt that this was a poor idea.

Especially interesting is the fact that those in the western Michigan and western Washington samples who felt that using windmills for electricity was a poor idea tended to disapprove more frequently of locating them along interstate highways than along shore lines. Also noteworthy is that the members of the "poor idea" group in southeastern Wyoming would be especially perturbed about locating windmills along shore lines as well as in open fields or along interstate highways.

When we relate approval or disapproval of possible windmill locations to the socio-demographic characteristics of the respondents, we find that in all areas, locating windmills along rural roads or interstate highways met with more frequent *approval* among those having more education and met with most frequent *disapproval* among those with the least education. Similarly, white-collar and professional people were more favorable than those in other occupations toward locating windmills along rural roads. In the western Michigan and Chicago areas, higher-income people were much more positive than others about locating windmills in open fields, on hills or mountains, and even along shore lines.

Pronounced sex and race differences are apparent in some of the responses to this question. Thus, a much higher proportion of male than of female respondents would approve of windmills on hills or mountains and along shore lines. The greatest differences are in the Chicago area sample, where the margins are 54 versus 38 percent, respectively, for placing windmills on hills or mountains and 54 versus 34 percent for locating windmills along shore lines.

In the Chicago area, the only sample with a sufficiently large number of nonwhite respondents, more whites than nonwhites (48 versus 34 percent) would approve of placing windmills by rural roads, as well as along interstate highways (49 versus 40 percent, respectively). The margin is especially large, curiously enough, on locating windmills in open fields, with 61 percent of the whites but only 38 percent of the nonwhites approving that site.

V. REACTIONS TO DIFFERENT TYPES OF WINDMILLS IN DIFFERENT SETTINGS

The focus of this chapter is on the reactions obtained from the sample members to the different wind energy machines shown in various settings. As mentioned in Chapter II, one stage of the interview involved getting people's reactions to 14 color slides, each showing a different type of wind energy machine in a different setting, with the exception of the first, which showed simply a string of power lines. The types of windmill designs and the settings used were described in Chapter II and are also cited in the headings of the tables in this chapter; reproductions of the slides are shown in Appendix A.

The slides were presented to the respondents in pairs, using a portable lighted slide viewer that provided 4X magnification. Thus, respondents would be shown Slide 1 and asked how pleasing to the eye they found the things in it. Next, they would be asked whether the scene would be more pleasing, less pleasing, or no different if the particular machine (in this case, power lines) were not there. The respondents would then be shown Slide 2 and asked the same questions. Finally, the respondents would be allowed to look again at both slides and would be asked which of the two pictures they found more pleasing. The interviewers would proceed in this manner to take up Slides 3 and 4, Slides 5 and 6, etc., until all 14 slides had been shown.

To cope with possible conditioning effects due to respondents becoming perhaps more lenient or more choosy as successive slides were shown, the order of presentation of 12 of these slides was rotated on a random systematic basis, as described in Chapter II. Although analysis revealed some evidence of order bias (see Appendix D), this rotation scheme seems to have compensated for the bias.

All 14 of the slides were used in the household interviews with the samples in western Michigan, southeastern Wyoming, western Washington, eastern Rhode Island, and the Chicago area. In the interviews in the beach area at Sandy Hook, New Jersey, only four of these slides were used (Slides 3, 4, 13, and 14) because of the difficulty of using this approach in bright sunlight and under more distracting conditions.

In this chapter, we first summarize the respondents' reactions to the various types of wind energy machines pictured in the slides. Then we discuss the effect that placing the windmills in different settings had on these reactions. The Sandy Hook data presented in this chapter are based on the Wave I interviews conducted before the windmill was constructed. The data for Wave II, after the windmill was in operation, will be discussed in the next chapter and compared with the results from Wave I.

A. Reactions to Different Windmills

In examining reactions to the different types of windmills, we shall compare the slides in the pairs in which they were shown to the respondents.

1. Power Lines versus Windmills (Slides 1 and 2)

Liking for a string of windmills exceeds that for a string of power lines, but the difference is not very great. This is one of the findings uncovered by an analysis of respondents' reactions to the first two slides, Slide 1 showing a string of power lines and Slide 2 showing a string of windmills. As is evident from the first part of Table 5.1, the percentage

TABLE 5.1

PUBLIC REACTIONS TO SLIDES 1 AND 2, BY AREA

(Percent)

Area	Slide 1 Power lines		Slide 2 Windmills	
	Picture "very" or "somewhat" pleasing			
Western Michigan	48		63	
Southeastern Wyoming	59		64	
Western Washington	52		64	
Eastern Rhode Island	54		70	
Chicago area	52		63	
All samples[a]	53		65	
	If power lines/windmills not there, scene would be--			
	More pleasing	No different	More pleasing	No different
Western Michigan	77	18	60	26
Southeastern Wyoming	65	28	58	34
Western Washington	68	24	56	33
Eastern Rhode Island	76	20	62	30
Chicago area	72	26	60	34
All samples[a]	72	23	59	31
	Preferred picture			
Western Michigan	30		70	
Southeastern Wyoming	23		77	
Western Washington	20		80	
Eastern Rhode Island	23		77	
Chicago area	25		75	
All samples[a]	24		76	

[a] Except Sandy Hook, New Jersey, where these questions were not asked.

of the respondents finding a particular scene pleasing varied roughly between 50 and 60 percent for the power lines and between 60 and 70 percent for the windmills.

Appreciable differences are evident when we relate reactions to the power-line scene to the socio-demographic characteristics of the respondents (see Table F.12 in Appendix F). Thus, overall the higher the education and income levels, the less pleasing the respondents found the scene. Also, in the Chicago sample, where there was a large enough percentage of nonwhites to compare with whites, nonwhites felt that the power-line scene was pleasing almost twice as often as whites. In contrast, reactions to the scene with a string of windmills varied little by respondents' socio-demographic characteristics (see Table F.13 in Appendix F).

If the power lines or windmills were not there, more than half of each sample would find the particular scene more pleasing. As brought out in the second part of Table 5.1, between 65 and 77 percent of the respondents felt that the scene would be more pleasing if the power lines were not there, with 7 to 17 percent fewer respondents in each sample area feeling the same way if the windmills were not there. Taking into account the proportion feeling that the scene would be no different if the power lines or windmills were not there, only about 5 percent felt that the scene would be *less* pleasing if the power lines were not there, and a slightly higher percentage would find the scene *less* pleasing without the windmills.

When presented with a choice of the two scenes, however, a large majority, between 70 and 80 percent, selected the scene with the windmills. In other words, while most sample members did not seem favorably impressed by either the power lines or the windmills, they clearly preferred the latter, when asked to make a choice.

Some interesting socio-demographic differences are evident in these comparisons (see Table F.14 in Appendix F). Those with less education more often found the power-line scene pleasing, whereas those with more education tended more frequently to prefer the windmill scene. Much higher proportions of high-income than of low-income people favored the windmill scene over the power-line scene--94 percent of those earning $20,000 or more in Rhode Island, compared with 61 percent of those earning less than $7,000; in Michigan, the corresponding figures were 88 and 62 percent, respectively.

Preference for the windmills over the power lines was expressed much more frequently by younger people than by older people. This was especially the case in western Washington, where 90 percent of those under 30 years of age preferred the windmills, compared with 67 percent of those 60 or over. It was also true in Wyoming (84 versus 51 percent, respectively). Older people may have become more accustomed to seeing power lines and therefore do not mind their presence, whereas younger people, possibly being more sensitive to visual pollution, are more likely to find windmills pleasing.

2. Horizontal Axis with Lattice Tower versus Darrieus (Slides 3 and 4)

The remaining 12 slides showed pictures of single windmills of different types in various settings, again in pairs. As noted previously, the order of presentation of the pairs was rotated. This rotational arrangement seems to have adjusted for order biases, as mentioned earlier. Hence, the order of presentation of the results here is arbitrary.

In making a comparison between a horizontal axis machine on a lattice tower and a Darrieus (eggbeater) machine, both in a prairie setting, there was no clear-cut general preference. To judge by the first part of Table 5.2, a larger percentage of the respondents in all six areas but Chicago

TABLE 5.2

PUBLIC REACTIONS TO SLIDES 3 AND 4, BY AREA

(Percent)

Area	Slide 3 Horizontal axis, lattice tower, flat land		Slide 4 Darrieus, flat land	
	Picture "very" or "somewhat" pleasing			
Western Michigan	79		57	
Southeastern Wyoming	74		64	
Western Washington	63		59	
Eastern Rhode Island	69		61	
Chicago area	70		76	
Sandy Hook, New Jersey[a]	86		80	
All samples	74		66	
	If windmill not there, scene would be--			
	More pleasing	No different	More pleasing	No different
Western Michigan	38	31	55	21
Southeastern Wyoming	48	37	52	30
Western Washington	52	35	50	30
Eastern Rhode Island	56	31	60	24
Chicago area	56	33	47	29
Sandy Hook, New Jersey[a]	38	43	34	42
All samples	48	35	50	29
	Preferred picture			
Western Michigan	61		39	
Southeastern Wyoming	48		52	
Western Washington	52		48	
Eastern Rhode Island	56		44	
Chicago area	34		66	
Sandy Hook, New Jersey[a]	38		62	
All samples	48		52	

[a] These figures are based on data obtained in the Wave I interviews at Sandy Hook before construction of the windmill.

found the horizontal axis machine more pleasing than the vertical axis Darrieus. When we relate reactions to each of these two windmills to the socio-demographic characteristics of the respondents, some differences are evident (see Tables F.15 and F.16 in Appendix F). Thus, those with at least some college education did not feel that either windmill was as pleasing as did those with some high school or less. This was especially true of reactions to the Darrieus in the Michigan sample. In Chicago, a greater percentage of nonwhites than whites responded that each of the windmills was pleasing.

The second part of Table 5.2 shows that a slightly higher proportion of sample members in the Chicago area, at Sandy Hook, New Jersey, and in western Washington said they would like the scene better if the horizontal axis machine were not there than if the Darrieus were not there. Only in western Michigan was there any strong sentiment to the contrary. Moreover, when the respondents were asked to make a choice between the two machines, the Darrieus was preferred by a majority in three of the samples and the horizontal axis machine in the other three samples, although in two of these instances (southeastern Wyoming and western Washington), the split was nearly 50-50.

The horizontal axis machine was more frequently preferred by those with some high school education or less, whereas the Darrieus was more likely to be preferred by those with at least some college education (see Table F.17 in Appendix F). There was also some tendency for the horizontal axis machine to be more frequently preferred by older people, and for the Darrieus to be more frequently preferred by younger people.

The biggest difference is by race. Thus, nonwhites in the Chicago sample (the only sample to have an appreciable number of nonwhites) much more frequently preferred the Darrieus than did whites; the relevant figures are 83 and 61 percent, respectively.

3. Horizontal Axis with Columnar Tower versus Old Dutch (Slides 5 and 6)

Whether it was because of romanticism of the past, the bicentennial year, or something else, sample members overwhelmingly preferred the sight of a Dutch-type windmill to a horizontal axis windmill, as is evident from Table 5.3. In fact, either type of windmill in a background setting of hills received favorable comments from about three-quarters or more of the respondents in these samples, but the proportion finding the Dutch-type windmill pleasing in this setting exceeded 85 percent in three of the five sample areas. Also, only a minority of each sample felt that the scene would be more pleasing if the old Dutch windmill were not there; the same was also true of the horizontal axis machine for three of the five samples, but to a lesser extent. When asked to make a choice between the two windmills, the respondents in all the samples chose the old Dutch windmill, by margins ranging from 2 to 1 to 4 to 1.

Interestingly enough, the horizontal axis machine was somewhat more frequently preferred by males than by females, by those at higher income levels and, particularly, by those with more education. For example, in southeastern Wyoming, only 24 percent of those with some high school or less preferred the scene with the horizontal axis machine, compared with 40 percent of those with at least some college education.

4. Horizontal Axis with Old Dutch Tower versus Giromill (Slides 7 and 8)

The comparison of the horizontal axis machine on an old Dutch tower and the Giromill, in a shore setting, indicates a strong preference for the

TABLE 5.3

PUBLIC REACTIONS TO SLIDES 5 AND 6, BY AREA

(Percent)

Area	Slide 5 Horizontal axis, columnar tower, hills		Slide 6 Old Dutch, hills	
	Picture "very" or "somewhat" pleasing			
Western Michigan	78		92	
Southeastern Wyoming	75		74	
Western Washington	70		83	
Eastern Rhode Island	73		87	
Chicago area	74		86	
All samples[a]	74		84	
	If windmill not there, scene would be--			
	More pleasing	No different	More pleasing	No different
Western Michigan	43	30	19	17
Southeastern Wyoming	49	36	42	26
Western Washington	54	32	33	26
Eastern Rhode Island	58	32	32	34
Chicago area	47	40	32	22
All samples[a]	50	34	31	25
	Preferred picture			
Western Michigan	18		82	
Southeastern Wyoming	34		66	
Western Washington	23		77	
Eastern Rhode Island	21		79	
Chicago area	21		79	
All samples[a]	23		77	

[a] Except Sandy Hook, New Jersey, where these questions were not asked.

modified Dutch windmill. As shown in Table 5.4, the proportion of respondents who found the scene with the latter pleasing varies between approximately 80 and 90 percent, whereas in no instance is the proportion who found the scene with the Giromill pleasing much over 40 percent. Correspondingly, roughly two-thirds or more of the respondents felt that the scene would be improved if the Giromill were not there, whereas only about one-third had the same reaction to the absence of the modified Dutch windmill. In the latter case, about as many respondents felt that the scene would be less pleasing in the absence of the modified Dutch windmill as felt that it would be more pleasing, whereas the proportion feeling that the scene would be less pleasing without the Giromill was generally about 10 percent.

When asked to choose between the two windmills, 80 percent or more of the respondents chose the modified Dutch type. Socio-demographic differences in these choices are not very pronounced. It is interesting that in the case of race, in both the Chicago and southeastern Wyoming samples (the latter, however, had only 18 nonwhites in the sample), a larger percentage of nonwhites than whites preferred the Giromill scene. In the Chicago area, 18 percent of the nonwhites chose the Giromill, compared with 16 percent of the whites. The comparable figures in southeastern Wyoming were 44 and 19, respectively.

5. Horizontal Axis with Columnar Tower versus Giromill (Slides 9 and 10)

Just as the Giromill did not fare too well when compared with the horizontal axis machine on an old Dutch tower, it was not regarded too favorably when compared with the horizontal axis machine on a columnar tower. As is evident from Table 5.5, approximately 70 to 80 percent of the respondents found the latter windmill pleasing in a prairie setting, compared with

TABLE 5.4

PUBLIC REACTIONS TO SLIDES 7 AND 8, BY AREA

(Percent)

Area	Slide 7 Horizontal axis, old Dutch tower, shore		Slide 8 Giromill, shore	
	Picture "very" or "somewhat" pleasing			
Western Michigan	86		37	
Southeastern Wyoming	79		39	
Western Washington	82		42	
Eastern Rhode Island	87		40	
Chicago area	81		43	
All samples[a]	83		40	
	If windmill not there, scene would be--			
	More pleasing	No different	More pleasing	No different
Western Michigan	31	23	70	14
Southeastern Wyoming	33	37	70	22
Western Washington	32	34	67	23
Eastern Rhode Island	35	35	73	18
Chicago area	36	35	65	22
All samples[a]	33	33	69	20
	Preferred picture			
Western Michigan	88		12	
Southeastern Wyoming	80		20	
Western Washington	84		16	
Eastern Rhode Island	86		14	
Chicago area	84		16	
All samples[a]	84		16	

[a] Except Sandy Hook, New Jersey, where these questions were not asked.

TABLE 5.5

PUBLIC REACTIONS TO SLIDES 9 AND 10, BY AREA

(Percent)

Area	Slide 9 Horizontal axis, columnar tower, flat land		Slide 10 Giromill, flat land	
	Picture "very" or "somewhat" pleasing			
Western Michigan	76		37	
Southeastern Wyoming	78		42	
Western Washington	69		43	
Eastern Rhode Island	72		39	
Chicago area	69		45	
All samples[a]	73		41	
	If windmill not there, scene would be--			
	More pleasing	No different	More pleasing	No different
Western Michigan	34	33	68	15
Southeastern Wyoming	44	41	69	22
Western Washington	46	38	65	23
Eastern Rhode Island	52	35	74	18
Chicago area	50	37	62	26
All samples[a]	45	37	68	21
	Preferred picture			
Western Michigan	82		18	
Southeastern Wyoming	83		17	
Western Washington	78		22	
Eastern Rhode Island	74		26	
Chicago area	74		26	
All samples[a]	78		22	

[a] Except Sandy Hook, New Jersey, where these questions were not asked.

only about 40 to 45 percent for the Giromill in the same setting. Well over half of each sample would find the scene more pleasing if the Giromill were not there, whereas half or less of each sample had the same reaction to absence of the horizontal axis machine. In addition, a substantial majority of each sample chose the horizontal axis machine in preference to the Giromill.

As before, nonwhites in the Chicago area were much more likely than whites to prefer the Giromill--the margin being 43 to 22 percent, respectively. The same was true in southeastern Wyoming, although, as mentioned previously, the number of nonwhites in that sample was very small. Age also seems to have made some difference, with younger people tending more frequently to prefer the Giromill, especially in western Michigan, western Washington, and the Chicago area.

On the other hand, preference for the horizontal axis machine over the Giromill rose sharply with education in the Chicago area (from 54 percent of those with some high school or less to 82 percent of those with at least some college education), and also in southeastern Wyoming and Rhode Island; but the opposite pattern is apparent to a slight extent in western Michigan and western Washington.

6. Horizontal Axis with Old Dutch Tower versus Darrieus (Slides 11 and 12)

In a hill setting, both the horizontal axis machine on an old Dutch tower and the Darrieus machine received a preponderance of favorable comments in all five areas where they were shown, as is evident from Table 5.6. The proportion finding the scene pleasing was much higher for the modified Dutch windmill than for the Darrieus. However, even in the latter case, these percentages were well above 50 percent.

TABLE 5.6

PUBLIC REACTIONS TO SLIDES 11 AND 12, BY AREA

(Percent)

Area	Slide 11 Horizontal axis, old Dutch tower, hills		Slide 12 Darrieus, hills	
	Picture "very" or "somewhat" pleasing			
Western Michigan	91		63	
Southeastern Wyoming	80		66	
Western Washington	88		64	
Eastern Rhode Island	84		59	
Chicago area	84		73	
All samples[a]	86		65	
	If windmill not there, scene would be--			
	More pleasing	No different	More pleasing	No different
Western Michigan	27	27	52	20
Southeastern Wyoming	42	31	51	33
Western Washington	36	31	52	28
Eastern Rhode Island	41	33	58	26
Chicago area	42	32	48	31
All samples[a]	38	31	52	28
	Preferred picture			
Western Michigan	65		35	
Southeastern Wyoming	57		43	
Western Washington	70		30	
Eastern Rhode Island	66		34	
Chicago area	56		44	
All samples[a]	63		37	

[a] Except Sandy Hook, New Jersey, where these questions were not asked.

About half of each sample felt that the scene would be more pleasing if the Darrieus were not there, while, as before, the proportion giving a similar reaction in the case of the modified Dutch windmill was much smaller. As one would expect, a higher proportion of each sample preferred the modified Dutch windmill to the Darrieus, although the margin was closer than when old Dutch or modified Dutch windmills were compared with the Giromill or the horizontal axis machine on a columnar or lattice tower. Indeed, in two of the areas, southeastern Wyoming and Chicago, nearly 45 percent expressed a preference for the Darrieus.

In most areas, preference for the Darrieus tended to be higher as the level of education rose. This machine was also preferred more among those at higher income levels. Race also seems to have made a difference: In the Chicago area, a greater percentage of nonwhites than whites (60 versus 40 percent, respectively) preferred the Darrieus.

7. Horizontal Axis with Lattice Tower versus Old Dutch (Slides 13 and 14)

Presented in a shore setting, the old Dutch windmill emerged an overwhelming favorite over the horizontal axis machine on a lattice tower. This might have been expected in view of the fact that Dutch windmills have traditionally been located (and pictured) along shore lines.

At least as significant, however, is the fact that two-thirds or more of the respondents in each of the six sample areas found pleasing the scene with the horizontal axis machine on the shore, as is evident from Table 5.7. Of particular interest is the fact that the two samples with the highest proportion finding this scene pleasing were located in areas along shore lines, namely, Sandy Hook and western Michigan. There was little difference

TABLE 5.7

PUBLIC REACTIONS TO SLIDES 13 AND 14, BY AREA

(Percent)

Area	Slide 13 Horizontal axis, lattice tower, shore		Slide 14 Old Dutch shore	
	Picture "very" or "somewhat" pleasing			
Western Michigan	75		93	
Southeastern Wyoming	68		82	
Western Washington	65		90	
Eastern Rhode Island	67		92	
Chicago area	63		86	
Sandy Hook, New Jersey[a]	80		91	
All samples	70		89	
	If windmill not there, scene would be--			
	More pleasing	No different	More pleasing	No different
Western Michigan	43	30	17	16
Southeastern Wyoming	53	33	30	32
Western Washington	51	32	25	27
Eastern Rhode Island	58	31	25	38
Chicago area	57	32	30	23
Sandy Hook, New Jersey[a]	38	46	23	32
All samples	50	34	25	28
	Preferred picture			
Western Michigan	11		89	
Southeastern Wyoming	23		77	
Western Washington	19		81	
Eastern Rhode Island	15		85	
Chicago area	17		83	
Sandy Hook, New Jersey[a]	18		82	
All samples	17		83	

[a] These figures are based on data obtained in the Wave I interviews at Sandy Hook before construction of the windmill.

in reactions to each of these two windmills by the socio-demographic characteristics of the respondents in these two samples or in the others (see Tables F.18 and F.19 in Appendix F).

Also, the second section of Table 5.7 shows that in these two areas, fewer than half of the respondents felt that they would find the scene more pleasing if the horizontal axis machine were not there; in the other four areas, approximately half or more of the respondents felt that absence of the machine would improve the scene.

The fact remains, however, that once again if the respondents had to make a choice, they would overwhelmingly choose the old Dutch windmill. This is less true for those with more education, for males than for females, (and in the Chicago area) for nonwhites than for whites (see Table F.20 in Appendix F).

B. Effect of Setting

To what extent does the setting in which a wind energy machine is pictured affect public reactions to that machine? Except for the old Dutch windmill design, the answer seems to be very little, judging by the comparisons made possible by the experimental design. Each of the six different windmill designs was shown on two different slides in alternative settings, as follows:

Type of windmill	Comparison
Horizontal axis, lattice tower	Flat land (3) versus shore (13)
Horizontal axis, columnar tower	Flat land (9) versus hills (5)
Old Dutch	Hills (6) versus shore (14)
Horizontal axis, old Dutch tower	Hills (11) versus shore (7)
Darrieus	Flat land (4) versus hills (12)
Giromill	Flat land (10) versus shore (8)

Comparisons of reactions to these windmills in these different settings can be made by rearranging the data from the preceding tables, as is done in Table 5.8. The data given in this table refer to answers to the questions dealing with whether the respondents found the scene pleasing and whether they felt that the scene would be more pleasing or no different if the machine were not there; answers to the question on which windmill they preferred are not useful here because it asked the respondents to compare each windmill with a different one.

As is evident from this table, reactions to the old Dutch windmill seemed to be even more favorable when it was viewed in a shore setting than in a hill setting, which is not surprising in view of the fact that such windmills have traditionally been located along shores. However, preference for the shore setting no longer held when the old Dutch-type tower was combined with a horizontal axis machine.

For the other four windmill designs, the preferences by setting were so small as to be easily ascribed to random sampling variations. There was a slight tendency for respondents to object less to the horizontal axis columnar tower windmill in a flat-land setting than in a hill setting: In four of the five areas, a smaller proportion of respondents would find the flat-land scene more pleasing if that windmill were not there than would find the hill scene more pleasing without that windmill.

Also, the horizontal axis machine on a lattice tower seems to have been received more favorably in a flat-land setting than on the shore. This was particularly true in the samples in southeastern Wyoming, in the Chicago area, and at Sandy Hook, New Jersey. Overall, a slightly lower percentage of respondents felt that the flat-land scene would be improved by the absence of that machine than felt that its absence would improve the shore scene.

TABLE 5.8

COMPARISON OF PUBLIC REACTIONS TO SAME WINDMILL IN ALTERNATIVE SETTINGS, BY AREA

(Percent)

Area	Horizontal axis, lattice tower		Horizontal axis, columnar tower	
	Flat land (3)	Shore (13)	Flat land (9)	Hills (5)
	Picture "very" or "somewhat" pleasing			
Western Michigan	79	75	76	78
Southeastern Wyoming	74	68	78	75
Western Washington	63	65	69	70
Eastern Rhode Island	69	67	72	73
Chicago area	70	63	69	74
Sandy Hook, New Jersey[a]	86	80	-[b]	-[b]
All samples	74	70	73	74

Area	Horizontal axis, lattice tower				Horizontal axis, columnar tower			
	Flat land (3)		Shore (13)		Flat land (9)		Hills (5)	
	If windmill not there, scene would be--							
	More pleasing	No different	More pleasing	No different	More pleasing	No different	More pleasing	No different
Western Michigan	38	31	43	30	34	33	43	30
Southeastern Wyoming	48	37	53	33	44	41	49	36
Western Washington	52	35	51	32	46	38	54	32
Eastern Rhode Island	56	31	58	31	52	35	58	32
Chicago area	56	33	57	32	50	37	47	40
Sandy Hook, New Jersey[a]	38	43	38	46	-[b]	-[b]	-[b]	-[b]
All samples	48	35	50	34	45	37	50	34

(Table 5.8 continued)

TABLE 5.8--Continued

Area	Old Dutch				Horizontal axis, Dutch tower			
	Hills (6)		Shore (14)		Hills (11)		Shore (7)	
	Picture "very" or "somewhat" pleasing							
Western Michigan	92		93		91		86	
Southeastern Wyoming	74		82		80		79	
Western Washington	83		90		88		82	
Eastern Rhode Island	87		92		84		87	
Chicago area	86		86		84		81	
Sandy Hook, New Jersey[a]	-[b]		91		-[b]		-[b]	
All samples	84		89		86		83	
	If windmill not there, scene would be--							
	More pleasing	No different	More pleasing	No different	More pleasing	No different	More pleasing	No different
Western Michigan	19	17	17	16	27	27	31	23
Southeastern Wyoming	42	26	30	32	42	31	33	37
Western Washington	33	26	25	27	36	31	32	34
Eastern Rhode Island	32	34	25	38	41	33	35	35
Chicago area	32	22	30	23	42	32	36	35
Sandy Hook, New Jersey[a]	-[b]	-[b]	23	32	-[b]	-[b]	-[b]	-[b]
All samples	31	25	25	28	38	31	33	33

(Table 5.8 continued)

TABLE 5.8--Continued

Area	Darrieus				Giromill			
	Flat land (4)		Hills (12)		Flat land (10)		Shore (8)	
	Picture "very" or "somewhat" pleasing							
Western Michigan	57		63		37		37	
Southeastern Wyoming	64		66		42		39	
Western Washington	59		64		43		42	
Eastern Rhode Island	61		59		39		40	
Chicago area	76		73		45		43	
Sandy Hook, New Jersey[a]	80		-[b]		-[b]		-[b]	
All samples	66		65		41		40	
	If windmill not there, scene would be--							
	More pleasing	No different	More pleasing	No different	More pleasing	No different	More pleasing	No different
Western Michigan	55	21	52	20	68	15	70	14
Southeastern Wyoming	52	30	51	33	69	22	70	22
Western Washington	50	30	52	28	65	23	67	23
Eastern Rhode Island	60	24	58	26	74	18	73	18
Chicago area	47	29	48	31	62	26	65	22
Sandy Hook, New Jersey[a]	34	42	-[b]	-[b]	-[b]	-[b]	-[b]	-[b]
All samples	50	29	52	28	68	21	69	20

[a] These figures are based on data obtained in the Wave I interviews at Sandy Hook before construction of the windmill.

[b] Slide not used at Sandy Hook.

VI. EFFECTS OF PRESENCE OF A WINDMILL ON PUBLIC REACTIONS

Four of the slides used in the five household surveys were also shown in the interviews at the Sandy Hook site. The preceding chapter included a comparison of the results obtained in Wave I at Sandy Hook, before the windmill was constructed, to those obtained for the same slides in the other five surveys. Since the study design involved two waves of interviews at Sandy Hook, we can compare the results obtained from respondents before and after the windmill was constructed to see if the presence of a windmill had any effect on their reactions.

At the Plum Brook NASA windmill site, where respondents also viewed a wind energy machine, the data collection was very different because that survey involved self-administered questionnaires. Hence, the use of slides was not possible. Instead, sketches of different wind energy machines were provided on the questionnaire, as shown in Questionnaire 4 in Appendix C, and respondents were asked to choose among them.

The results of these two different methods of presenting various windmill designs to respondents are discussed in this chapter. First, we compare the results obtained on the four slides used at Sandy Hook for those interviewed before the windmill was erected and those interviewed as they looked at the windmill. Second, results are presented on the preferences obtained from the people filling out self-administered forms while viewing the windmill at the NASA Plum Brook site.

A. The Windmill Experiment at Sandy Hook

To what extent are people's attitudes and reactions to windmills influenced by viewing an actual windmill? This question is critical to the validity of attitude measurement. It is difficult to tell how realistic a person's reaction may be when presented with a hypothetical question, even when that question is bolstered by showing photographs. Certainly there is considerable evidence in the social science literature that seeing or experiencing the "real thing" may result in a very different sort of attitude or behavior than would have been expected on the basis of hypothetical, or even intentions, questions.

Although it was clearly not possible to construct windmills of the size and on the scale that would be required for commercial operations, it was felt that at least some idea of this conditioning effect could be obtained by erecting one type of windmill in one location and interviewing a sample of visitors to the area with basically the same questions that had been asked of another sample of people visiting the area before the windmill had been erected. Because of the National Park Service's interest in this project, such a windmill was erected at a frequently visited site in a national park, namely, at the Sandy Hook Unit of the Gateway National Recreation Area in New Jersey. This windmill, pictured in Figure 6.1, is of the horizontal axis type with three blades, each 16.5 feet in diameter, set on a 40-foot tower. It is a 6-kilowatt machine operating at a speed of 30 miles per hour at maximum power. It was erected close to a rest area at one of the principal beaches and near the entrance to a visitor center at the park.

The survey plan was to interview approximately 300 people, selected in a statistical probability manner, who visited that site prior to the construction of the windmill (Wave I), and then to interview another approximately

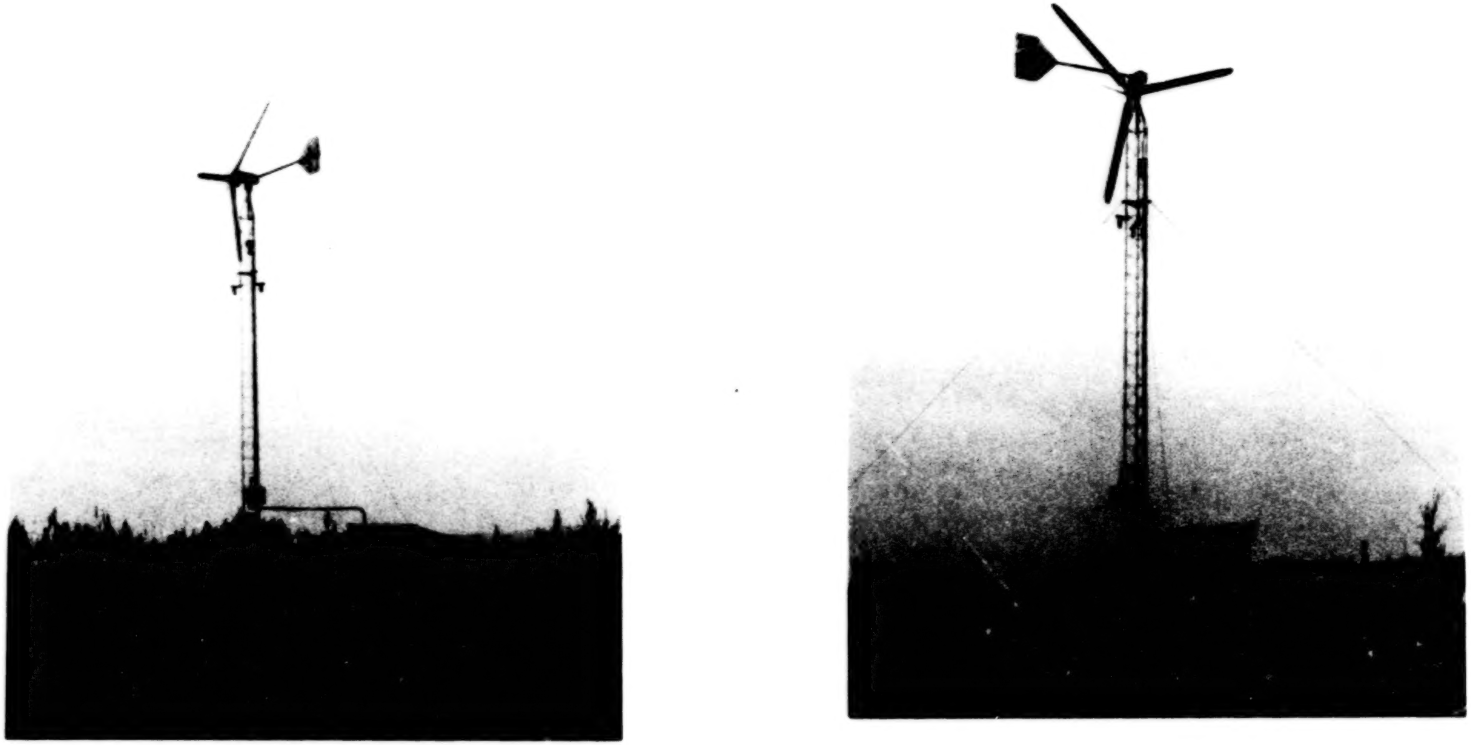


Fig. 6.1. Two Views of Windmill at Sandy Hook, New Jersey.

300 people, similarly selected, after the windmill was in operation (Wave II). The sampling procedures used for the two waves are described in Appendix B. Needless to say, the people interviewed in the second wave were not the same individuals interviewed in the first wave, which is unfortunate from a statistical point of view but unavoidable from a practical point of view.

The questions put to these two samples of individuals were identical except for the fact that in the second wave the respondents were also asked questions about the actual windmill similar to the questions asked while viewing slides of windmills, namely, how pleasing to the eye the respondents found the windmill that had been constructed and whether the scene would be more pleasing, less pleasing, or no different if the windmill were not there. In addition, they were asked if they thought that the windmill would be more pleasing in another location in the area and, if so, where. Copies of the two questionnaires are presented in Appendix C.

Because of the difficulty of using a slide viewer in broad daylight, only two pairs of slides were shown in these two waves of interviews, compared with the seven pairs used in the household surveys. For maximum comparability with the windmill itself, both pairs of slides used at Sandy Hook contained one slide that showed a horizontal axis machine. In one case, respondents were asked to compare it with a Darrieus (eggbeater) machine in a flat-land setting and in the other case with an old Dutch windmill in a shoreline setting. Hence, comparisons could be made of the horizontal axis machine viewed on the slides in relation both to the other machines and to the actual windmill that the people were viewing.

1. Effects on Policy Attitudes

What effect did the presence of the windmill have on people's reactions?

In a general sense, the answer would seem to be "very little," to judge from Table 6.1. This table compares answers obtained before and after erection of the windmill to one factual question on use of electricity in the home for particular purposes, to two variants of a question on attitudes toward eight different energy sources for the production of electricity, to a question on attitudes toward using pollution-free sources of electric power if it meant increased costs, and to one on reactions to various possible locations for windmills.

In all instances, the differences between the two sets of answers are very small. In the case of the factual question on electricity use, none of the percentages differs significantly in a statistical sense (at the .05 probability level) from what would be expected as a result of random sampling variation. On the approval of alternative energy sources for the production of electric energy, the people interviewed in the presence of the windmill (Wave II) mentioned most alternatives other than solar and wind energy less frequently, but only in the case of natural gas is the difference statistically significant. Possibly more important in the present connection is that the frequency of mentions of solar energy and wind energy (either as a general source or as the preferred source) are in each case virtually identical for the two waves.

The frequency of disapproval of particular windmill locations also seems to be virtually the same for the two samples. However, differences of a very systematic nature do show up in the proportion of the sample that would be in favor of pollution-free energy even if it meant paying higher prices for electricity. Although only the difference in the proportion who would pay 25 percent more is statistically significant, a higher proportion

TABLE 6.1

DISTRIBUTION OF RESPONSES TO GENERAL QUESTIONS ON ELECTRIC ENERGY AND WINDMILLS, BEFORE AND AFTER ERECTION OF WINDMILL, SANDY HOOK, NEW JERSEY (WAVES I AND II)

(Percent)

Response	Wave I	Wave II
Use electricity in home:		
Central heating	22	17
Central air conditioning	24	22
Room air conditioner	58	56
Hot water heater	42	37
Cooking with an electric range	33	36
Drying clothes with an electric dryer	51	47
Base (range)[a]	(302-314)	(333-337)
Approval of source for production of electricity:		
Solar energy	96	96
Hydroelectricity from dams	91	90
Wind energy from windmills	88	88
Nuclear energy	70	64
Deep-shaft coal	52	55
Natural gas	46	34
Oil from wells	40	38
Strip-mined coal	39	36
Base (range)[a]	(260-308)	(277-331)
Electric energy source that "should be used the most":		
Solar energy	47	48
Hydroelectricity	13	12
Wind energy	8	8
Nuclear energy	18	20
Deep-shaft coal	1	5
Natural gas	8	3
Oil	2	2
Strip-mined coal	2	3
Total	99[b]	101[b]
Base	(309)	(316)

(Table 6.1 continued)

TABLE 6.1--Continued

Response	Wave I	Wave II
Sensitivity to increases in cost of electricity to pay for pollution-free energy:		
Would pay 10% more	77	82
Would pay 25% more	39	48
Would pay 50% more	16	21
Base	(311)	(335)
Disapproval of specific locations for windmills:		
Along roads in rural areas	9	8
Along interstate highways	11	9
In open fields	6	6
On the slopes of hills or mountains	13	14
Along the shores of lakes or oceans	18	17
Base (range)[a]	(312-314)	(333-336)

[a] Base varies because of differing number of "No answers" for each source or location.

[b] Not 100 percent because of rounding.

of the Wave II sample than of the Wave I sample would pay each of the three hypothetical price increases.

2. Choice of Windmill Designs

The presence of the horizontal axis windmill apparently made people feel less favorable toward horizontal axis machines in comparison with both a Darrieus machine and an old Dutch windmill. The differences are not large but are highly uniform, as can be seen in Tables 6.2 and 6.3.

From Table 6.2, we see that the proportion of the respondents saying that the slide picturing a horizontal axis machine in a flat-land setting was not too pleasing or not at all pleasing rose from 14 percent before the actual windmill was erected at the site to 20 percent afterward. At the same time, no change was recorded in the proportion reporting that the slide of a Darrius machine in a similar setting was not pleasing: that figure was unchanged at 20 percent. There was a slight increase in the proportion feeling that the scene would be more pleasing if the horizontal axis machine were not in the picture, namely, from 38 to 42 percent. Admittedly, there was also a slight increase in the proportion feeling that the scene would be more pleasing if the Darrieus machine were not there. However, a larger proportion of those interviewed in Wave II, after erection of the windmill, felt that the scene on the slide would be *less* pleasing if the Darrieus machine were not there, whereas there was no change in the proportion giving such a reaction for the slide with the horizontal axis machine.

Perhaps most important, on the key question regarding which picture they thought was more pleasing, the proportion selecting the Darrieus machine rose from 62 percent before the horizontal axis machine was erected to 65 percent afterward.

TABLE 6.2

PUBLIC REACTIONS TO SLIDES OF HORIZONTAL AXIS AND DARRIEUS MACHINES, SANDY HOOK, NEW JERSEY (WAVES I AND II)

(Percent)

Reaction	Slide 3 Horizontal axis, lattice tower, flat land		Slide 4 Darrieus, flat land	
	Wave I	Wave II	Wave I	Wave II
Reaction toward picture:				
Very pleasing	27	28	38	39
Somewhat pleasing	59	52	42	41
Not too pleasing	8	16	12	13
Not at all pleasing	6	4	8	7
Total	100	100	100	100
Base	(308)	(334)	(306)	(334)
If windmill not there, picture would be--				
More pleasing	38	42	34	36
No different	43	40	42	36
Less pleasing	19	19	24	28
Total	100	101[a]	100	100
Base	(307)	(334)	(302)	(330)
	Wave I		Wave II	
Preferred picture:				
Horizontal axis	38		35	
Darrieus	62		65	
Total	100		100	
Base	(303)		(324)	

[a] Not 100 percent because of rounding.

TABLE 6.3

PUBLIC REACTIONS TO SLIDES OF HORIZONTAL AXIS AND OLD DUTCH MACHINES, SANDY HOOK, NEW JERSEY (WAVES I AND II)

(Percent)

Reaction	Slide 13 Horizontal axis, lattice tower, shore		Slide 14 Old Dutch, shore	
	Wave I	Wave II	Wave I	Wave II
Reaction toward picture:				
Very pleasing	26	28	67	72
Somewhat pleasing	55	48	23	21
Not too pleasing	12	19	6	4
Not at all pleasing	7	6	3	4
Total	100	101[a]	99[a]	101[a]
Base	(313)	(334)	(310)	(335)
If windmill not there, picture would be--				
More pleasing	38	43	23	26
No different	46	39	32	26
Less pleasing	16	18	45	47
Total	100	100	100	99[a]
Base	(309)	(334)	(310)	(329)
	Wave I		Wave II	
Preferred picture:				
Horizontal axis	18		13	
Old Dutch	82		87	
Total	100		100	
Base	(308)		(330)	

[a] Not 100 percent because of rounding.

Yet it might be noted that the proportion of both samples that were displeased with the scene containing the horizontal axis windmill was rather small, about one in five. The proportion feeling that the scene would be more pleasing if the windmill were not there was also still a minority, although a rather substantial one, namely, over 40 percent. The clear implication would seem to be that people were more favorably impressed by the general scene than by the horizontal axis machine pictured therein and that, at least from an aesthetic point of view, latent opposition to this type of windmill could be rather substantial.

These observations receive further support from Table 6.3, which reports the results of the reactions of the two samples in comparing a horizontal axis machine and an old Dutch windmill. Both of these slides pictured the machines in a shore-line setting, which was, in fact, quite similar to the setting in which the respondents were being interviewed. The fact that the old Dutch machine remained much more popular is only to be expected, in view of the results from the household surveys in this study. It is clearly evident, however, that the margin of preference for the Dutch-type machine increased when respondents reported their reactions in the presence of the horizontal axis machine. Thus, as with Table 6.2, the proportion not too pleased or not at all pleased with the picture showing the horizontal axis machine increased (from 19 percent before erection of the actual windmill to 25 percent afterward); the proportion feeling that the scene would be more pleasing in the absence of the windmill also increased (from 38 to 43 percent); and most important, the proportion choosing the old Dutch machine over the horizontal axis machine rose from 82 to 87 percent. Again, these differences are not statistically significant in view of the relatively small sample sizes. However, their uniform direction adds to the impression that these effects are real and not just due to sampling variation.

A further indication of the actual windmill's negative influence arises when we examine the reactions of the respondents to the windmill itself. As is evident from Table 6.4, 65 percent felt that the windmill was "pleasing to the eye," certainly a majority. However, this proportion was considerably less than the 81 percent of those interviewed before erection of the windmill who felt that the picture of the horizontal axis machine in a shore setting was pleasing.

Rather surprisingly, a smaller proportion of the sample members in Wave II felt that the scene at Sandy Hook would be more pleasing if the windmill were not there than the proportion in Wave I who made a similar statement with regard to the slide of the horizontal axis machine in the shore-line setting. Only one-fourth of the respondents felt that the view would be more pleasing if the actual machine were not there, whereas 38 percent of those interviewed in Wave I felt that the shore-line scene would be more pleasing if the horizontal axis machine were not in the picture. On the other hand, only 8 percent felt that the view at Sandy Hook would be less pleasing in the absence of the machine, compared to twice that proportion in Wave I who gave the same answer about the horizontal axis machine in the picture.

The implication remains that there would still be a considerable minority that would not be too receptive to windmills of this type. At the same time, it should be stressed that the windmill erected at Sandy Hook is not an especially attractive machine from an aesthetic point of view, and it should be possible to make considerable improvements in its appearance without affecting its performance. From this point of view, the reactions to the NASA machine at Plum Brook are of particular interest.

TABLE 6.4

PUBLIC REACTIONS TO HORIZONTAL AXIS WINDMILL ERECTED AT SANDY HOOK, NEW JERSEY (WAVE II)

Reaction	Percent
Reaction toward actual windmill:	
Very pleasing	15
Somewhat pleasing	50
Not too pleasing	27
Not at all pleasing	8
Total	100
Base	(333)
If windmill not there, scene would be--	
More pleasing	25
No different	67
Less pleasing	8
Total	100
Base	(332)
Windmill would be more pleasing in another location:	
Yes	18
No	82
Total	100
Base	(335)

B. Reactions to NASA's Plum Brook Wind Machine

As noted in Chapter II, data collection at the location of the NASA windmill was not part of the original study. However, the NASA Lewis Research Center offered to distribute short questionnaires to visitors who came to view the 100-kilowatt wind energy machine at its Plum Brook site near Sandusky, Ohio (see Figure 6.2). Since these questionnaires were self-administered, it was not possible to use the personal interview survey instrument or show the slides that were used in the main study in the other parts of the country. The respondents at Plum Brook were asked to record on a brief form (see Appendix C, Questionnaire 4) the reason that they came to see the NASA windmill, their impressions of the machine, their choice among three alternative windmill designs sketched on the form, and their attitudes toward using more sources of electric power that were pollution free even if it meant an increase in the cost of electricity. They were also asked several questions about their personal characteristics, such as age, sex, and education.

The original plan was to gather information from about 300 visitors, which would have meant a convenience sample similar in size to the probability samples used in the other survey locations in this study. However, because of the smaller number of visitors during the survey period at Plum Brook (August and September, 1976), this special sample contained only 154 respondents. The atypical nature of this sample is brought out by the fact that 56 percent of these people made a special trip to see the wind machine because of their interest or professional affiliation with the subject area, and the other 44 percent came because they were in the area and had heard of the NASA machine. As might be expected, the respondents were mostly midwesterners, with nearly three-quarters (73 percent) living in Ohio or a

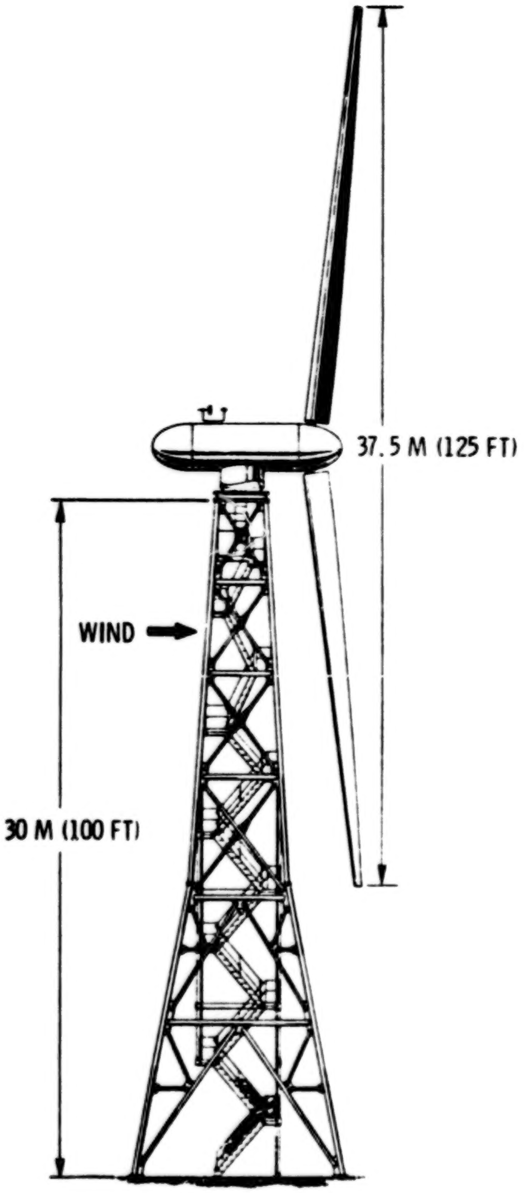


Fig. 6.2. The Wind Turbine at the NASA Lewis Research Center Plum Brook Site near Sandusky, Ohio.

contiguous state. The sample was also atypical in the sense that only 44 percent of the respondents lived in a big city or a suburb of a big city. (The actual proportion of the U.S. population living in these areas as of 1970 was 68 percent.) Also, 69 percent of the respondents were male, and 42 percent were college graduates.

This lack of representativeness is especially frustrating when we attempt to interpret the fact that, in contrast to the interviews on horizontal axis machines conducted in the other areas in this study, the reaction of the respondents at Plum Brook was highly favorable. When asked how pleasing the area would be to them if the machine were not there, 24 percent felt that it would be less pleasing, 74 percent felt that it would be no different, and only 2 percent felt that the area would be more pleasing. Those with a college education were much more likely to take a positive attitude toward the machine. Thus, 33 percent of the respondents who were college graduates felt that the area would be less pleasing without the machine, compared with 18 percent of those with a high school education or less. No differences in the response patterns were evident, however, by sex, age, or area of residence.

Would these people be willing to have such a machine near their homes? Only 3 percent said "No." Over three-quarters (78 percent) replied in the affirmative, and 19 percent said "Maybe." Interestingly enough, a much higher proportion of males than of females gave a positive answer--84 versus 63 percent, respectively. There were no differences by the other respondent characteristics.

Respondents were also asked to indicate whether they would be willing to have such a machine on a lake shore or sea coast and in a national park. Rather curiously, one-fifth to one-quarter of the people did not answer these questions, which would suggest considerable uncertainty on their part. Of those who did answer, 91 percent were favorable toward having the machine on a shore or coast and 76 percent were favorable toward locating one in a park. Negative answers were negligible (1 percent) for the shore location but rose to 10 percent for the park location. Again, there was a tendency for males more frequently than females to be favorable toward both of these locations, and for those with at least some college education to be more favorable than those with only a high school education or less.

How would the respondents feel about having a string of such machines along a coastline, about a half-mile apart? Over three-quarters (76 percent) would approve, 20 percent would not care, and only 3 percent would disapprove. Differences by respondent characteristics were small.

The three windmill designs among which respondents were asked to choose were (1) a horizontal axis machine on a lattice tower similar to the NASA machine, (2) a Darrieus machine, and (3) a horizontal axis machine on a columnar tower (see Appendix C, Questionnaire 4). As the last row in Table 6.5 shows, nearly half (49 percent) of the group selected the horizontal axis machine on the columnar tower, the Darrieus machine was preferred by 28 percent, and the horizontal axis machine on a lattice tower was chosen by the remaining 23 percent.

Although the sample was small, pronounced differences are apparent by the various characteristics of the respondents, as brought out in Table 6.5. Thus, males were more likely than females to choose the horizontal axis machine on a lattice tower, whereas the reverse was true for the Darrieus machine. Older people more than younger also tended to prefer the horizontal axis machine on a lattice tower. Even more striking is the fact that this machine was preferred by 39 percent of those with a high school education or less but by only 13 percent of those who were college graduates.

TABLE 6.5

PREFERENCE FOR THREE ALTERNATIVE WINDMILL DESIGNS, BY RESPONDENT CHARACTERISTICS, PLUM BROOK SITE

(Percent Preferring Each Design)

Characteristic	(1) Horizontal axis, lattice tower	(2) Darrieus	(3) Horizontal axis, columnar tower	Total	Base
Sex:					
Male	26	25	50	101[a]	(101)
Female	17	35	48	100	(46)
Age:					
Under 30	18	27	54	99[a]	(33)
30 - 49	22	34	45	101[a]	(65)
50 and over	30	23	46	99[a]	(43)
Education:					
High school or less	39	27	34	100	(44)
Some college	20	28	52	100	(40)
College graduate	13	29	58	100	(62)
All respondents	23	28	49	100	(147)

[a] Not 100 percent because of rounding.

The latter group was much more likely to select the horizontal axis machine on the columnar tower.

In considering these results, the small size and unrepresentativeness of the sample should be stressed. For this reason, no attempt is made to apply statistical tests or to draw any sort of generalization. Nevertheless, the data do suggest further avenues for exploration, especially since the results are not inconsistent with those found in the other locations in this study. For example, in these other locations the horizontal axis machine on a lattice tower was also more frequently preferred by those with less education and by males more than females. Also, in these other locations the horizontal axis machine on a columnar tower was more often preferred by those with more education.

How did the Plum Brook visitors feel about using pollution-free sources of electric power even if it meant an increase in the cost of electricity? If the cost were only 10 percent higher, 91 percent of the respondents would be in favor of pollution-free sources. If a 25-percent increase were necessary, the proportion in favor of using pollution-free sources was still more than half (61 percent), but the percentage dropped to 29 percent if the cost were increased 50 percent. There was some tendency for older people and for males rather than females to be in favor of paying this extra cost.

Compared with the proportions of the samples in the other parts of the country who would pay extra for pollution-free energy, an interesting pattern of differences emerges. The proportion of the Plum Brook sample who would pay 10 percent more was much larger than those in the six statistical probability samples--91 percent versus a range of 61 to 84 percent in the other areas. Similarly, a considerably larger proportion of the Plum Brook respondents would pay 25 percent more (61 percent compared with a range of 31-53 percent in the other areas). Even when a 50-percent increase was suggested, those at this site were more willing than those sampled elsewhere to pay it (29 percent compared with 9-26 percent elsewhere). In other words, the presumably more knowledgeable and more interested group represented at Plum Brook would seem to be much more willing to pay more for pollution-free energy. It should be stressed, however, that this sample was clearly unrepresentative of the general population.

VII. MULTIVARIATE ANALYSIS OF DETERMINANTS OF PUBLIC ATTITUDES AND REACTIONS TOWARD WINDMILLS

In the final section of the interviews in this study, respondents were asked a number of questions about their socioeconomic and demographic characteristics. How important are these socio-demographic variables in explaining the different attitudes and reactions expressed by the respondents in these surveys? To what extent do these variables serve to explain variations in these attitudes among different respondents? For example, is age an important determinant of attitudes toward paying extra for pollution-free energy even after education is held constant?

This chapter focuses on an analysis of the relationship between the socio-demographic characteristics of respondents to the five household surveys and their responses to other questions asked in the interview. The Sandy Hook samples were omitted from this analysis since those respondents were not asked the income question owing to the conditions under which the interviews were conducted.

The preceding chapters of this report have provided a great deal of material on the influence of the socio-demographic variables individually. We have seen, for example, that knowledge of wind energy seems to vary by education and age of the respondent as well as among the different areas in which people were interviewed. However, these variables are themselves intercorrelated--older people tend to have less education than younger people, for example. For this reason, there is a very real possibility that these relationships are superficial and may not really exist once the correlations among the socio-demographic variables are taken into account. In effect, what we want are measures of the net effect of each socio-demographic variable, that is, the effect of each variable after the influence of the others has been taken into account.

This can be accomplished by various forms of multivariate analysis, whereby the influence of all the socio-demographic variables on a particular dependent variable is measured simultaneously, allowing for correlations among these variables. The specific method used here is multiple regression analysis, a technique that yields an estimate of the net influence of each so-called independent variable (in this case, each of the socio-demographic variables) on the attitude under study, known more technically as the dependent variable. Very briefly, the technique involves setting up an equation expressing the dependent variable as a function of all the independent variables under consideration. Thus, if we want to examine the effect of the different socio-demographic variables on attitudes toward paying 10 percent more for pollution-free energy, one way to do so is to set up the following linear arithmetic equation:

$$Y = a + b_1 X_1 + b_2 X_2 \ldots + b_p X_p + e$$

In this equation, Y represents the answer of a particular respondent to the question on paying 10 percent extra for pollution-free energy, expressed as a dichotomous variable--1 if yes, 0 if no. The X's represent the different socio-demographic variables. Thus, X_1 might represent level of education, X_2 might represent income level, etc. These variables could either be continuous, such as years of education or dollars of income, or they could be dichotomous, such as sex, where male would be assigned the value 1 and female the value 0.

The b's are the coefficients to be estimated. They reflect the influence of the corresponding variable and, when adjusted for differences in the units of measurement, represent the relative influence of the different variables; in this form they are known as beta coefficients.

The coefficients of such an equation can be estimated by various methods, the most usual being ordinary least squares, which is the one used here. This procedure also yields estimates of the sampling variability of these coefficients. This enables one to ascertain the likelihood that a particular coefficient is sufficiently different from zero to indicate that the particular variable has a real effect and is not exhibiting a spurious influence as a result of sampling variations.

Also, this procedure yields an estimate of the total variation in the dependent variable explained by the set of independent variables, which is known as the coefficient of multiple determination, or R^2. Adjusted for the number of variables in an equation in relation to the number of observations, a more unbiased measure, this statistic is denoted as ${R^*}^2$. The highest value this statistic can have is 1.00, indicating a perfect fit, and the lowest is 0, indicating absence of any explanation by the independent variables. In practice, with survey data based on individual respondents as the unit of observation, values of ${R^*}^2$ on the order of .1 or .2 are quite respectable.

The multiple regression technique was applied to each of the following attitudinal or knowledge variables in turn:

a. Attitude toward using pollution-free energy even if cost of electricity were to increase 10 percent

b. Attitude toward using pollution-free energy even if cost of electricity were to increase 25 percent

c. Attitude toward using pollution-free energy even if cost of electricity were to increase 50 percent

d. Heard of solar energy

e. Heard of wind energy

f. Attitude toward the idea of using windmills to generate electric power

In addition, the technique was applied to expressed reactions to a number of different slides in order to explore how well these reactions might be accounted for by various socio-demographic variables. Of the 14 slides of different types of windmills in different settings shown to respondents, the following were selected for this analysis:

1. String of power lines in a flat-land setting
2. String of horizontal axis windmills in a flat-land setting
3. Horizontal axis machine on a lattice tower in a flat-land setting
4. Darrieus (eggbeater) machine in a flat-land setting

13. Horizontal axis machine on a lattice tower in a shore setting
14. Old Dutch windmill in a shore setting

For purposes of the multiple regression analysis, a subset of reactions to these slides was selected, namely:

g. Whether Slide 2 was pleasing

h. Preference of Slide 1 over Slide 2

i. Whether Slide 3 was pleasing

j. Whether Slide 4 was pleasing

k. Preference of Slide 3 over Slide 4

l. Whether Slide 13 was pleasing

m. Whether Slide 14 was pleasing

n. Preference of Slide 13 over Slide 14

These questions are sufficiently representative to yield a good idea of the influence of the various socio-demographic variables on reactions to the different windmill designs and locations.

The result of this analysis was 14 regression equations, each containing the same set of independent variables: education, income, age, use of electricity in the home (measured by number of different purposes for which electricity was used as described in the second part of Appendix E), size of place, homeownership status, sex, race, and geographical area of sample. To highlight the variables that are most important, the two tables that follow indicate by pluses and minuses which variables have positive or negative effects, with signs shown opposite a particular variable only where it is statistically significant at the .10 level or more. Where one sign is shown, it means that only one time out of ten (the .10 level) could a coefficient differing as much from zero as that have occurred as a result of sampling variations. Two signs indicate that the significance level rises to .05, and three signs mean that the significance level rises to .01. Clearly, a variable having a coefficient significant at the .01 level is far more likely to be really meaningful than one significant at the .10 level, but even in the latter case, the probabilities are so small that it seems worth bringing that coefficient to the reader's attention.

A brief word of explanation should help to understand the data in Table 7.1, which summarizes the results of the regression analysis for the

TABLE 7.1

SUMMARY OF REGRESSIONS OF SELECTED ATTITUDE AND KNOWLEDGE RESPONSES ON SOCIO-DEMOGRAPHIC VARIABLES[a]

Socio-demographic variable	Dependent variable					
	Use pollution-free energy even if cost increase of--			Heard of --		Use wind-mills for electricity
	10%	25%	50%	Solar energy	Wind energy	
Education	+++	+++	+++	+++		++
Income	+++	++		++		
Age	---		---		+	
Use of electricity in home					---	
Size of place:						
City of 100,000+						
Suburb of city						
Town of 50,000-100,000					--	
Town of 10,000-50,000					-	
Town of 5,000-10,000						
Town of 1,000-5,000					-	
Rural area						

(Table 7.1 continued)

TABLE 7.1--Continued

Socio-demographic variable	Dependent variable					
	Use pollution-free energy even if cost increase of--			Heard of --		Use wind-mills for electricity
	10%	25%	50%	Solar energy	Wind energy	
Homeownership status (own)		---		++	+	
Sex (male)	--			+++	+++	
Race (white)				+++	++	
Geographic area of sample:						
Western Michigan			-	---		+++
Southeastern Wyoming	+++	++		-		++
Western Washington	+++	+++	++	-		
Chicago area			--	--	---	
R^{*2}	.105	.091	.053	.115	.092	.029

[a] No plus or minus sign in a cell indicates lack of significance of coefficient at the .10 level. One sign means significance at the .10 level, two at the .05 level, and three at the .01 level.

six attitudinal and knowledge variables. The first four socio-demographic characteristics--education, income, age, and use of electricity in the home--are continuous variables. All the others are dichotomous in the sense that if a respondent has that characteristic, the variable takes the value 1; otherwise it takes the value 0. This is also true for the different samples, of which four are listed in the tables. In a set of dichotomous variables such as area, or size of place, one variable has to be omitted for mathematical reasons, and in this case it was the variable for eastern Rhode Island. This means that the coefficients for geographic area are all relative to the omitted variable, Rhode Island.

A. General Attitudes and Knowledge

To judge from the results in Table 7.1, the six attitudinal and knowledge items studied are affected by a number of socio-demographic variables, among which education, income, age, homeownership, and geographic area figure prominently.

Each of the columns in this table represents a separate regression function, the dependent variable for which is indicated at the head of the column. Thus, for the first data column, the dependent variable is attitude toward using pollution-free energy even if the cost of electricity were to increase 10 percent. Looking down that column, we see that both education and income have three plus signs, indicating highly significant relationships to this dependent variable at the .01 level or more (meaning a probability of .99 that there really is a relationship) and in a positive direction. In other words, respondents with a higher level of education or a higher level of income were much more likely to be in favor of paying

10 percent more for pollution-free energy. On the other hand, the three minus signs in that column opposite age tell us that age is negatively correlated with this dependent variable with a significance level of .01 or more, meaning that younger people were much more likely than older to give a positive answer to the suggestion of paying 10 percent more. The two minus signs for sex indicate that being male is also negatively correlated with the dependent variable but at a lower level of significance (.05), meaning a probability of .95 that males were more likely than females to give a negative answer to paying 10 percent more. In addition, the three positive signs opposite southeastern Wyoming and western Washington indicate that respondents in those areas were much more likely than those in the base area, eastern Rhode Island, to be in favor of paying 10 percent more for pollution-free energy.

The figure at the bottom shows that 10 percent of the total variation in the answers to this question is explained by this set of independent variables, a moderately successful degree of "goodness of fit" for this type of data.

One thing readily apparent from an examination of Table 7.1 is that only a few of the independent variables are related significantly to each of the dependent variables even at the .10 probability level (one plus or minus sign). Moreover, the overall goodness of fit is not especially high, varying from barely 3 percent of the variability explained on people's attitudes toward the use of windmills for electricity to 12 percent on whether people had heard of solar energy. In other words, by far the largest part of the variation in these dependent variables remains to be explained.

In view of the multitude of factors that influence people's attitudes and preferences, however, this is not surprising. Still, it is something to keep in mind as we examine the variables that are significant.

Of particular interest when we look at these independent variables is that some of them are statistically significant rather frequently and consistently. Most prominent in this respect is the strong positive influence of education. In other words, there is apparently a general tendency for favorable attitudes toward paying more for pollution-free energy, knowledge of wind or other forms of solar energy, and favorable attitudes toward the idea of using windmills to generate electricity to increase as the level of education rises. This finding supports the cross-tabulation results in the earlier reports and indicates that those with more education have more knowledge about these forms of energy and also (and perhaps because of this fact) have a much more positive attitude toward it.

The positive effect of income is another supportive finding of the earlier material, the more so since the technique used holds constant the level of education, so that one cannot ascribe this relationship to the fact that education and income tend to be positively correlated. Rather, the positive influence of income, while less frequent than education, seems to be a separate phenomenon and may be indicative of the greater interest of high-income people in the newer forms of energy.

Age as related to attitudes toward paying more for pollution-free energy shows up strongly too, but in a negative manner. Again, this corroborates the simpler cross-tabulation results showing that, as one might expect, younger people are more conscious of pollution problems and more frequently in favor of paying increased costs to avoid pollution.

The size-of-place variables indicate that residents of smaller towns are less likely to have heard of wind energy. However, the results for the homeownership variable indicate that owners are more likely than renters to be aware of solar and wind energy. Similarly, the results for sex and race indicate that males more than females and whites more than non-whites have heard of solar and wind energy.

B. Does Knowledge Determine Attitudes?

To what extent does knowledge about solar and wind energy influence attitudes toward paying extra for pollution-free energy? There is considerable evidence from past studies that attitudes are affected by knowledge of a subject, and it is therefore important to investigate this question in the present context, especially since knowledge is a variable subject to policy manipulation.

In the present instance, we have two knowledge variables (both based on self-reports), one attitude variable on the use of windmills to generate electricity, and three other attitudinal variables on sensitivity toward paying more for pollution-free energy. Examining these data brings some interesting relationships to light.

First, analysis shows that the two knowledge variables are interrelated. In other words, a person who has heard something about wind energy is more likely than someone who has not heard anything about wind energy to have also heard something about solar energy. This would not seem unexpected. What is unexpected is the very low degree of this relationship, namely, that only 5 percent of the variance in one variable is associated with the other.

Second, the correlation between having heard about wind energy and attitude toward use of windmills to generate electricity is also positive. Again, however, the relationship is very low, the proportion of the variance common in the two variables being only 4 percent.

Third, tests of the effect of all three of these variables on attitudes toward paying more for pollution-free energy, using the regression methods discussed earlier, yield mixed results. Each of these variables taken separately is correlated positively with each of the three "pay more" variables. When these variables are combined in a multiple regression format with the socio-demographic variables used previously, only two of these variables are statistically significant. Thus, knowledge of solar energy has a strong positive impact on willingness to pay 10 percent more for pollution-free energy, raising the explained variance of that function from 10.4 to 11.3 percent.

In addition, attitude toward use of wind energy for generating electricity has a correspondingly strong positive impact on the "pay 25 percent more" variable, raising its explained variance from 9.1 to 10.1 percent. This is an increase of roughly 11 percent in the explained variance and suggests that this variable has a substantial impact. The same variable is not statistically significant at even the .10 level in the other two functions, although it does appear with a positive sign.

Overall, it would therefore seem that while knowledge does seem to influence attitudes, and in a positive manner, this effect is not so pronounced as has been found in other subject areas. It should be stressed, however, that these knowledge variables are based on self-reports, the accuracy of which is not known.

C. Attitudes toward Windmill Designs

Turning to the results of the regressions of attitudes toward the different windmill designs on the socio-demographic variables (Table 7.2), we see that on the whole these variables do not have much explanatory power. The goodness of fit for these eight equations ranges from 1 percent to only 7 percent, much less than that obtained for the general attitude and knowledge variables (Table 7.1). Nevertheless, some relationships are apparent and suggest interesting possibilities for future study.

One of the principal results relates once more to education, the variable in the first row of this table. These regressions suggest that those with more education seem to be more innovative in their preferences. The more educated preferred the scene with a string of windmills (Slide 2) to that with a string of power lines (Slide 1), and they preferred the Darrieus machine (Slide 4) in comparison to the horizontal axis machine (Slide 3). They were also less likely than other educational groups to find the old Dutch windmill (Slide 14) pleasing.

Other relationships in this table may also be suggestive of basic attitudes. Thus, the results for Slide 2 (string of horizontal axis windmills) and Slide 3 (single horizontal axis machine on a lattice tower) raise the possibility that homeowners are likely to be more positive than renters toward horizontal axis windmills. To judge from the results for Slide 13 (horizontal axis) and Slide 14 (old Dutch), females are apparently much more likely than males to prefer the old Dutch design to the horizontal axis design, and a similar inference might be made about the preference of whites versus nonwhites. By geographic area, members of the Chicago sample were less likely than those in the Rhode Island (base) sample to prefer strings of horizontal axis windmills to strings of power lines.

TABLE 7.2

SUMMARY OF REGRESSIONS OF REACTIONS TO SLIDES OF DIFFERENT WINDMILLS ON SOCIO-DEMOGRAPHIC VARIABLES[a]

Socio-demographic variable	Dependent variable							
	Slide 2 (string of windmills) pleasing	Prefer Slide 1 (power lines) to Slide 2	Slide 3 (horizontal, lattice, flat) pleasing	Slide 4 (Darrieus, flat) pleasing	Prefer Slide 3 to Slide 4	Slide 13 (horizontal, lattice, shore) pleasing	Slide 14 (old Dutch, shore) pleasing	Prefer Slide 13 to Slide 14
Education		--	--		---		---	
Income		---						
Age					++	+++		
Use of electricity in home				--				
Size of place:								
City of 100,000+				+++	---			
Suburb of city					-			
Town of 50,000-100,000								
Town of 10,000-50,000								
Town of 5,000-10,000								
Town of 1,000-5,000								
Rural area								

(Table 7.2 continued)

TABLE 7.2--Continued

Socio-demographic variable	Dependent variable: Slide 2 (string of windmills) pleasing	Prefer Slide 1 (power lines) to Slide 2	Slide 3 (horizontal, lattice, flat) pleasing	Slide 4 (Darrieus, flat) pleasing	Prefer Slide 3 to Slide 4	Slide 13 (horizontal, lattice, shore) pleasing	Slide 14 (old Dutch, shore) pleasing	Prefer Slide 13 to Slide 14
Homeownership status (own)	++		+++					
Sex (male)						++	--	++
Race (white)	--	---					++	
Geographic area of sample:								
Western Michigan		++						
Southeastern Wyoming							---	++
Western Washington			--					
Chicago area	---		-					
R^{*2}	.011	.066	.036	.034	.053	.019	.040	.016

[a] No plus or minus sign in a cell indicates lack of significance of coefficient at the .10 level. One sign means significance at the .10 level, two at the .05 level, and three at the .01 level.

Overall, the multivatiate analyses in this chapter support and sharpen the earlier findings. Certain socio-demographic characteristics are highlighted as being of principal importance in affecting both attitudes toward wind energy and windmill preferences. Most notable of these is education. Even holding education contstant, however, other socio-demographic factors have effects of their own, principally income, age, sex, race, and homeownership. These are not the only variables likely to enter into an explanation of such complex phenomena as attitudes and preferences--knowledge of wind energy presents another set of possibilities--but they would seem to provide a sound basis for future work on this subject.

APPENDIX A

PICTURES OF THE SLIDES

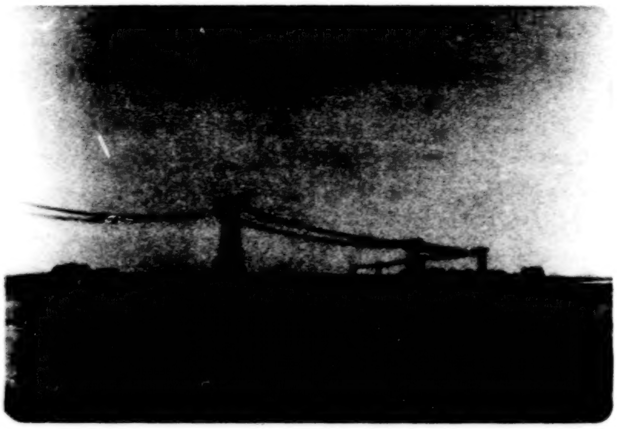


Fig. A.1. Slide 1--String of Power Lines in a Flat-land Setting.

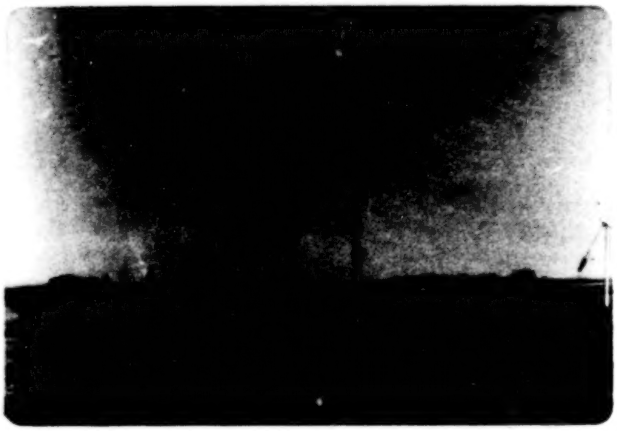


Fig. A.2. Slide 2--String of Windmills in a Flat-land Setting.

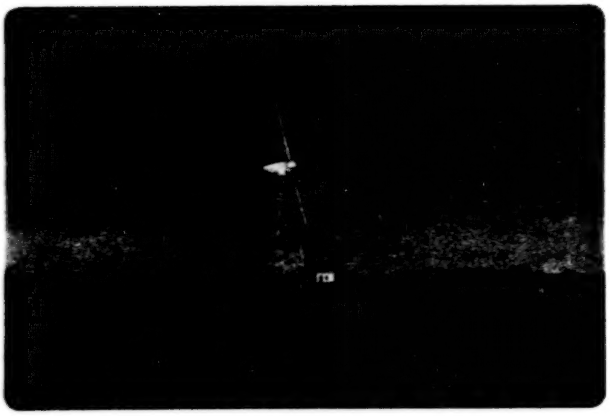


Fig. A.3. Slide 3--Horizontal Axis Machine on a Lattice Tower in a Flat-land Setting.

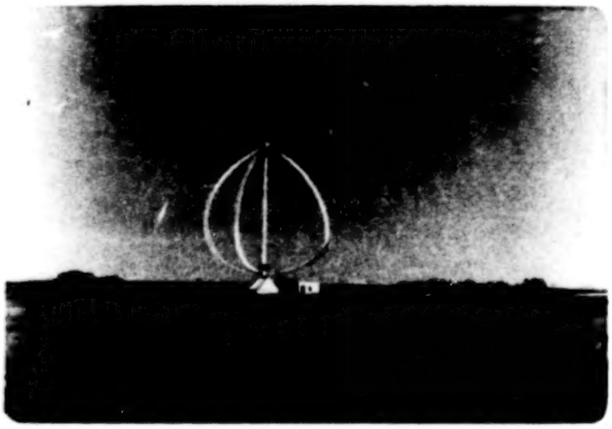


Fig. A.4. Slide 4--Darrieus Machine in a Flat-land Setting.

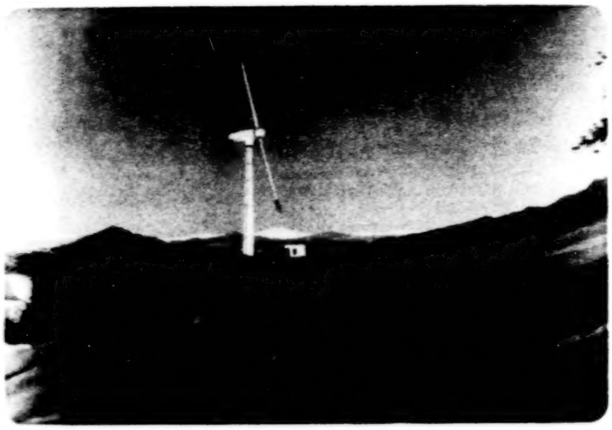


Fig. A.5. Slide 5--Horizontal Axis Machine on a Columnar Tower in a Hill Setting.

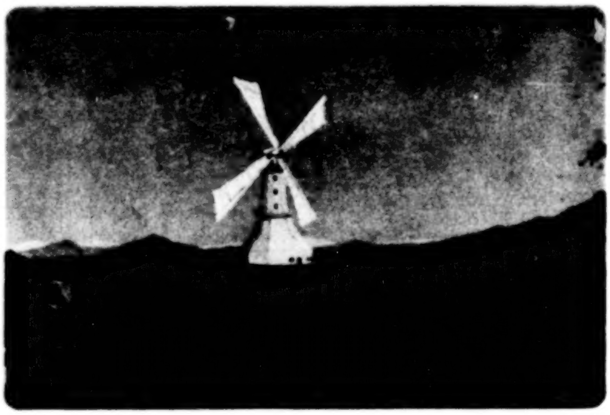


Fig. A.6. Slide 6--Old Dutch Windmill in a Hill Setting.

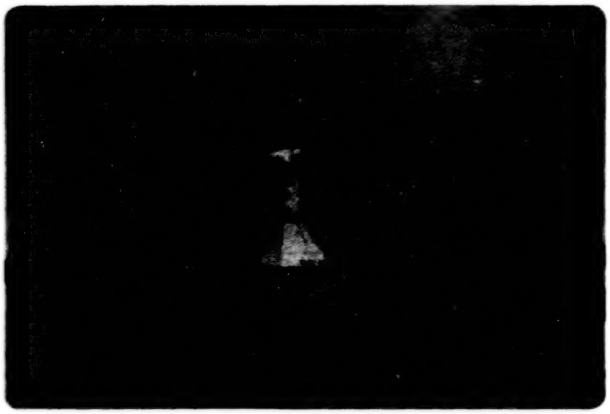


Fig. A.7. Slide 7--Horizontal Axis Machine on an Old Dutch Tower in a Shore Setting.

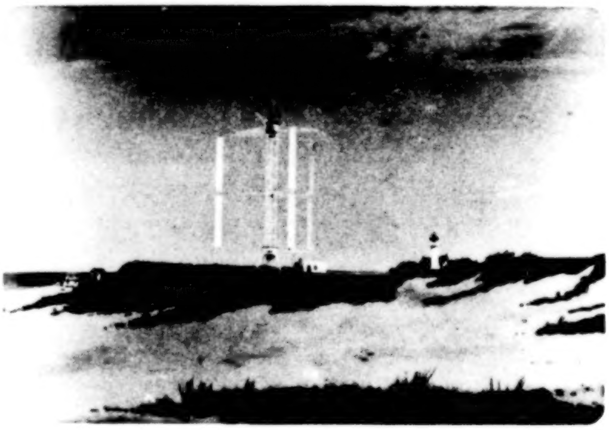


Fig. A.8. Slide 8--Giromill in a Shore Setting.

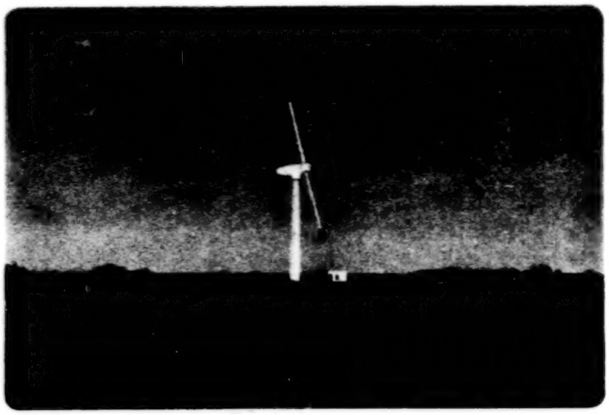


Fig. A.9. Slide 9--Horizontal Axis Machine on a Columnar Tower in a Flat-land Setting.

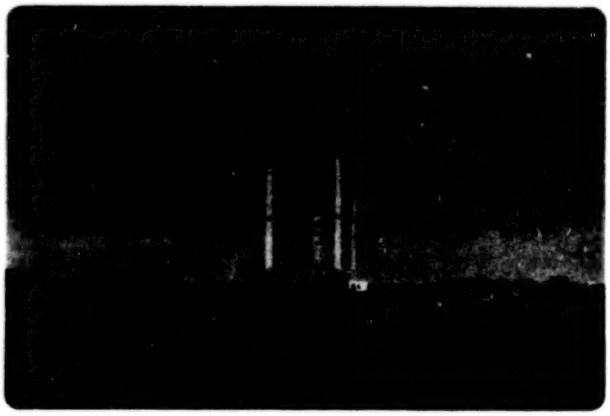


Fig. A.10. Slide 10--Giromill in a Flat-land Setting.

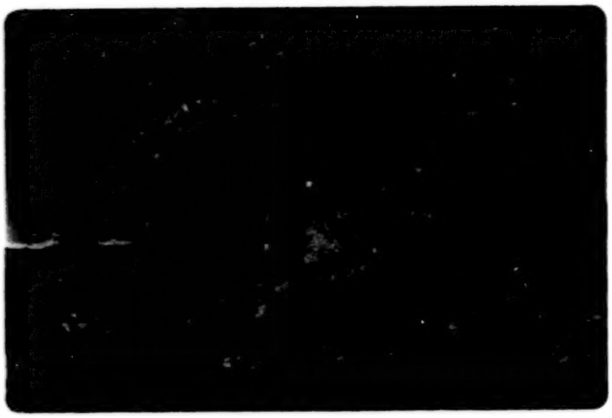


Fig. A.11. Slide 11--Horizontal Axis Machine on an Old Dutch Tower in a Hill Setting.

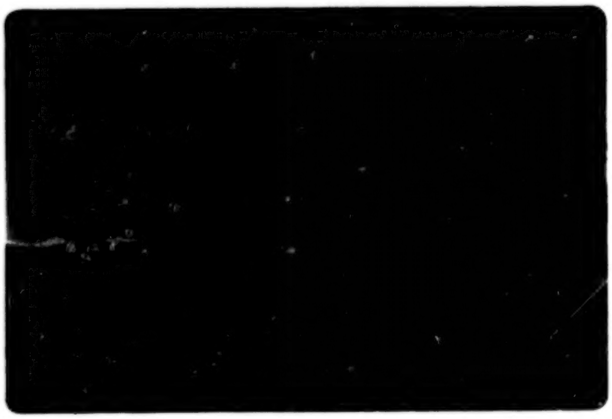


Fig. A.12. Slide 12--Darrieus Machine in a Hill Setting.

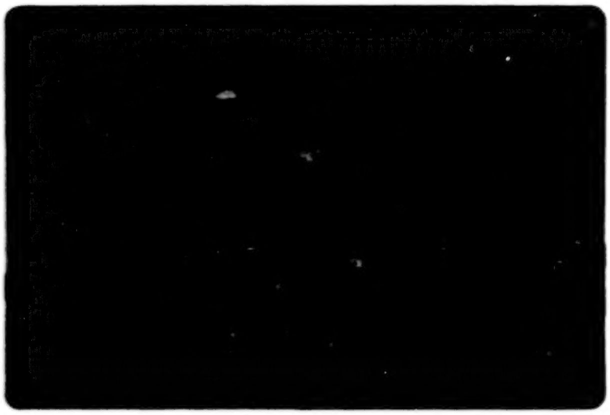


Fig. A.13. Slide 13--Horizontal Axis Machine on a Lattice Tower in a Shore Setting.

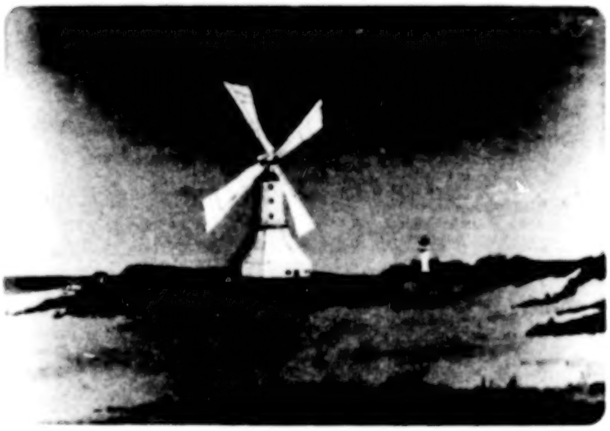


Fig. A.14. Slide 14--Old Dutch Windmill in a Shore Setting.

APPENDIX B

SITE SAMPLE AT SANDY HOOK UNIT, GATEWAY NATIONAL RECREATION AREA

The universe for this study was visits to the Sandy Hook Unit of the Gateway National Recreation Area in June and July and in September, 1976. The target population was visitors who were U.S. citizens, age 18 or older, and not employees of the park. It was required that 300 interviews be completed in each of the two waves of data collection. Time probability sampling was used in both waves.

Wave I--June and July, 1976

Nine days were selected with probabilities proportionate to size, in terms of estimated number of visits, from a 14-day data-collection period. On each selected day, the hours 8 A.M.-8 P.M. were divided into five-minute time segments. Because estimates of the number of visits for each time segment were not available, time segments were selected by simple random sampling rather than by probability proportionate to size. The three-hour period from 11 A.M. to 2 P.M. was identified as the peak visitation period, and that period was double sampled each day. Fifty-four time segments were sampled from each of the time days, with one selection made per time segment, yielding a total sample of 486, of which half were to be selected in peak periods.

Since all autos must pass through the same entrance gate, sample selection was made at that point. Thus, the first auto to pass through the gate during a selected time segment was sampled. Within each selected auto, one person was selected using a simple random sample of eligibles. The probabilities of selection of time segments in Wave 1 were as follows:

$$P_{\text{peak period}} = \frac{\text{Segments to be selected}}{\text{Total peak segments}} = \frac{243}{324} = .75$$

$$P_{\text{non-peak}} = \frac{\text{Segments to be selected}}{\text{Total nonpeak segments}} = .25$$

Average probability of selection of car was

$$P_{\text{car}} = \frac{\text{Cars to be selected}}{\text{Total estimated traffic}} = \frac{486}{47{,}793}$$

$$= .01$$

The final disposition of the sample for Wave I was as follows:

Total sample	486	
Total ineligible	124	
Total eligible (autos)	362	100%
Interviews	314	87
Refusals	37	10
Other	11	3

Wave II--September, 1976

Because of data-collection scheduling problems, it was decided to select eight consecutive days for the Wave II field work. Therefore, the sample of time segments was divided over the eight days in proportion to the expected number of visits (based on data from the previous year). Except for this change in procedure, sampling was done as in Wave I. The relevant probabilities were

$$P_{\text{peak period}} = \frac{\text{Segments to be selected}}{\text{Total peak segments}} = \frac{245}{288} = .851$$

$$P_{\text{non-peak period}} = \frac{\text{Segments to be selected}}{\text{Total nonpeak segments}} = \frac{245}{864} = .284$$

Average probability of selection of a car was

$$P_{car} = \frac{\text{Cars to be selected}}{\text{Total estimated traffic}} = \frac{490}{7,750}$$

$$= .063$$

The final disposition of the sample for Wave II was

Total sample	490	
Total ineligible	116	
Total eligible (autos)	374	100%
Interviews	337	90
Refusals	32	9
Other	5	1

APPENDIX C

SURVEY QUESTIONNAIRES

1. Main Questionnaire
2. Sandy Hook Questionnaire--Wave I
3. Sandy Hook Questionnaire--Wave II
4. Plum Brook Questionnaire

4/76

ID#________ 1-4

Study # 251 5-7

Intvr # ________ 8-10

SURVEY RESEARCH LABORATORY

UNIVERSITY OF ILLINOIS

WIND ENERGY STUDY

(Time interview began ________ [ ] *AM*
[ ] *PM)*

1. Do you use electricity in your home for . . .

	Yes	No	
a. Central heating?	1	2	11
b. Central air-conditioning?	1	2	12
c. Room air-conditioner?	1	2	13
d. Hot water heater?	1	2	14
e. Cooking with an electric range?	1	2	15
f. Drying clothes with an electric dryer?	1	2	16

2a. As you know, the U.S. is having problems with the supply and cost of energy sources such as electricity, oil, and natural gas. For each of the following statements, I'd like to know if you strongly agree, agree, disagree, or strongly disagree.

	Strongly agree	Agree	Disagree	Strongly disagree	*(Don't know)*	
(1) The U.S. should produce as much energy as possible and import from other countries whatever else is needed. Do you	1	2	3	4	*8*	17
(2) The U.S. should produce as much energy as possible, but limit usage so that little need be imported	1	2	3	4	*8*	18
(3) The U.S. should ration energy usage so that none need be imported	1	2	3	4	*8*	19

b. Which option do you think is the best? *(Show Card 1)* # __________ 20

3a. There are several ways in which electricity can be generated. Do you think that we should produce our electricity by using . . .

	Yes	No	*(Don't know)*	
(1) Natural gas?	1	2	*8*	21
(2) Oil from wells?	1	2	*8*	22
(3) Hydroelectricity from dams? . .	1	2	*8*	23
(4) Coal from strip mining?	1	2	*8*	24
(5) Coal from deep shaft mining? .	1	2	*8*	25
(6) Solar energy from the sun? . .	1	2	*8*	26
(7) Nuclear energy?	1	2	*8*	27
(8) Wind energy from windmills? . .	1	2	*8*	28

b. Which one source should be used the most? *(Show Card 2)* #________ 29

4a. What do you see as the advantages of producing electricity by using *(Yes's above)?*

Source #(1-8)	Advantages	
#______	______________________________	30-32
#______	______________________________	33-35
#______	______________________________	36-38
#______	______________________________	39-41
#______	______________________________	42-44
#______	______________________________	45-47
#______	______________________________	48-50
#______	______________________________	51-53

b. What do you see as the disadvantages of producing electricity by using *(No's above)?*

Source #(1-8) Disadvantages

#______ ________________________________ 54-56

#______ ________________________________ 57-59

#______ ________________________________ 60-62

#______ ________________________________ 63-65

#______ ________________________________ 66-68

#______ ________________________________ 69-71

#______ ________________________________ 72-74

#______ ________________________________ 75-77

5a. Some sources of electric power cause much less pollution than others, but they are also more expensive. Do you think that the country should use more of these pollution-free sources, even if it means that the cost of electricity would go up by, say, 10%?

Yes 1 78

No *(Skip to Q.6a)* 2

b. What if the cost would go up by 25%. Would you favor using these pollution-free sources?

Yes 1 79

No *(Skip to Q.6a)* 2

80 | 1
1-4 | DUP

c. What if the cost would go up by 50%. Would you favor using these pollution-free sources?

Yes 1 5

No 2

6a. One source of electricity is energy from the sun--solar energy. Have you heard anything about solar energy?

Yes 1 6
No *(Skip to Q.7a)* 2

b. What have you heard? ______________________________ 7,8

______________________________ 9,10

____

7a. Another source of electricity is wind energy, generated by windmills. Have you heard anything about this?

Yes 1 11
No *(Skip to Q.8)* 2

b. What have you heard? ______________________________ 12,13

______________________________ 14,15

____

8. In general, what do you think about the idea of using windmills to generate electric power? Do you think it's a good idea, a fair idea, or a poor idea?

Good 1 16
Fair 2
Poor 3
(Don't know) *8*

9. Windmills could be located in various places. Would you approve, disapprove or not care if they were put . . .

	Approve	Not care	Disapprove	
a. Along roads in rural areas?	1	2	3	17
b. Along interstate highways?	1	2	3	18
c. In open fields?	1	2	3	19
d. On the slopes of hills or mountains?	1	2	3	20
e. Along the shores of lakes or oceans?	1	2	3	21

	Slide 1 (Power lines)	Slide 2 (Windmills)	
10a. Would you please look at the picture in the viewer and tell me what you notice about it.	________	________	
	________	________	
	________	________	
b. How pleasing to the eye do you find the things in this picture? Would you say . . .			
Very pleasing, ...	1	1	22,23
Somewhat pleasing, ...	2	2	
Not too pleasing, ...	3	3	
Not at all pleasing?	4	4	
(Don't know)	*8*	*8*	
c. What do you think of the power lines (windmills) in this picture? Do you think if they were not there the scene would be . . .			
More pleasing, ...	1	1	24,25
Less pleasing, or	2	2	
No different?	3	3	
(Don't know)	*8*	*8*	

---

d. Of the 2 pictures you have just seen, which one do you think is more pleasing to the eye--the first one or the second one?

First *(#1, power lines)*	1	26
Second *(#2, windmills)*	2	
(Don't know)	*8*	

A

	Slide 3	Slide 4	Slide 5	Slide 6
11a. Here is another picture. How pleasing to the eye do you find the things in this picture? Would you say . . .				
Very pleasing, ...	1	$1_{27,28}$	1	$1_{32,33}$
Somewhat pleasing, ...	2	2	2	2
Not too pleasing, or . . .	3	3	3	3
Not at all pleasing? . . .	4	4	4	4
(Don't know)	*8*	*8*	*8*	*8*
b. What do you think of the windmill in this picture? Do you think if it were not there the scene would be . . .				
More pleasing, ...	1	$1_{29,30}$	1	$1_{34,35}$
Less pleasing, or	2	2	2	2
No different?	3	3	3	3
(Don't know)	*8*	*8*	*8*	*8*

c. Of the 2 pictures you have just seen, which one do you think is more pleasing to the eye, the first, or second? *(Show slides again if necessary.)*

First *(#3, Horiz, Lattice, Farm)* . . . 1_{31}

Second *(#4, Eggbeater, Farm)* 2

(Don't know) *8*

First *(#5, Horiz, Column, Mts.)* . 1_{36}

Second *(#6, Old Dutch, Mts.)* . . . 2

(Don't know) *8*

B

11a. Here is another picture. How pleasing to the eye do you find the things in this picture? Would you say . . .

	Slide 7	Slide 8	Slide 9	Slide 10
Very pleasing, ...	1	1 37,38	1	1 42,43
Somewhat pleasing, ...	2	2	2	2
Not too pleasing, or . . .	3	3	3	3
Not at all pleasing? . . .	4	4	4	4
(Don't know)	*8*	*8*	*8*	*8*

b. What do you think of the windmill in this picture? Do you think if it were not there the scene would be . . .

	Slide 7	Slide 8	Slide 9	Slide 10
More pleasing, ...	1	1 39,40	1	1 44,45
Less pleasing, or	2	2	2	2
No different?	3	3	3	3
(Don't know)	*8*	*8*	*8*	*8*

---

c. Of the 2 pictures you have just seen, which one do you think is more pleasing to the eye, the first, or second? *(Show slides again if necessary.)*

First *(#7, Horiz, Dutch, Shore)* 1 41	First *(#9, Horiz., Column, Farm)* 1 46
Second *(#8, Giromill, Shore)* 2	Second *(#10, Giromill, Farm)* . 2
(Don't know) *8*	*(Don't know)*. *8*

B

C

11a. Here is another picture. How pleasing to the eye do you find the things in this picture? Would you say . . .

	Slide 11	Slide 12	Slide 13	Slide 14
Very pleasing, ...	1	$1_{47,48}$	1	$1_{52,53}$
Somewhat pleasing, ...	2	2	2	2
Not too pleasing, or . . .	3	3	3	3
Not at all pleasing? . . .	4	4	4	4
(Don't know)	*8*	*8*	*8*	*8*

b. What do you think of the windmill in this picture? Do you think if it were not there the scene would be . . .

	Slide 11	Slide 12	Slide 13	Slide 14
More pleasing, ...	1	$1_{49,50}$	1	$1_{54,55}$
Less pleasing, or	2	2	2	2
No different?	3	3	3	3
(Don't know)	*8*	*8*	*8*	*8*

c. Of the 2 pictures you have just seen, which one do you think is more pleasing to the eye, the first, or second? *(Show slides again if necessary.)*

First *(#11, Horiz, Dutch, Mts.)* . . . . 1_{51}	First*(#13, Horiz, Lattice, Shore*
Second *(#12, Eggbeater, Mts.)* 2	Second *(#14, Old Dutch, Shore)* .
(Don't know) *8*	*(Don't know)* . . . .

Now I'd like to ask you a few questions about you and your family so that we can see how your opinions compare with those of other people.

14. Where do you live? ______________________________________ 57,58
(City) *(State)*

15. Please look at this card and tell me which category best describes where you live. *(Show Card 3)*

City of 100,000+ 1 59
Suburb of city 2
Town of 50-100,000 3
Town of 10-50,000 4
Town of 5-10,000 5
Town of 1-5,000 6
Town of less than 1,000 . . . 7
Rural area 8

16. Do you live in . . .

A single family house or duplex, ... 1 60
An apartment, condominium or multi-family house, or 2
A mobile home or trailer? 3
Other *(Specify)* ________________________________ 4

17. Do you own or rent your home?

Own 1 61
Rent 2

18. Are you the head of the household, the spouse of the head, or some other family member?

Head 1 62
Spouse of head 2
Son/daughter 3
Father/mother 4
Other relation *(Specify)* . . . 5
____
No relation 6

19a. What is the main occupation of the head of the household, that is, what kind of work does he/she do?

______________________________ 63-65
66,67

b. What is his/her job title?

____

c. In what type of business or industry is that?

____

d. Is this mainly . . .

Manufacturing, ... 1
Wholesale, ... 2
Retail, ... 3
Service, or 4
Something else? *(Specify)*
______________________________ 5

20a. Including yourself, how many people live in this (your) household?

__________ 68,69

b. How many are under 18?

__________ 70

21. In what year were you born? __________ 71-73

22. What is the highest level of formal education you obtained?

Grammar school or less 1 74
Some high school 2
High school graduate 3
Some college 4
College graduate 5
Post graduate degree 6

23a. For statistical purposes we need to know into which income group your household fell in 1975. This is to be total income before taxes and should include your own income and that of the other members of your household. Please look at this card and tell me the letter which appears next to your income group. *(Show Card 4)*

a. No income 01 75,76
b. Under $2,000/year 02
c. $2,000 to $2,999/year 03
d. $3,000 to $4,999/year 04
e. $5,000 to $6,999/year 05
f. $7,000 to $8,999/year 06
g. $9,000 to $11,999/year 07
h. $12,000 to $14,999/year 08
i. $15,000 to $19,999/year 09
j. $20,000 to $29,999/year 10
k. $30,000 or more/year 11
l. *(Don't know--Refused)(Ask part b)* . *88*

(If "R" refuses or is not sure, ask Q.23b, otherwise skip to Q.24.)

b. Can you tell me if your household income in 1975 was . . .

More than $12,000, or 1 77
Less than $12,000 per year? . . 2
(Don't know) *8*
(Refused) *9*

THANK YOU FOR YOUR COOPERATION.

24. Sex of respondent *(Circle--but do not ask)*

Male 1 78
Female 2

25. Race of respondent *(Circle--but do not ask)*

White 1 79
Black 2
Spanish speaking . . . 3
Oriental 4

(Time interview ended ______ [ ]AM, [ ]PM)

80|2

Interviewer signature ______________________________

Interviewer ID# _____________

Date of interview _____________________

Coder ID# __________

Check-coder ID# __________

ID#______	1-4
Study # 251	5-7
	8-10 | BK

6/76

SURVEY RESEARCH LABORATORY

UNIVERSITY OF ILLINOIS

WIND ENERGY STUDY

WIND ENERGY MACHINE SITE

154

(Time interview began ________ [ ] *AM)*
[ ] *PM*

1. Do you use electricity in your home for . . .

	Yes	No	
a. Central heating?	1	2	11
b. Central air-conditioning?	1	2	12
c. Room air-conditioner?	1	2	13
d. Hot water heater?	1	2	14
e. Cooking with an electric range?	1	2	15
f. Drying clothes with an electric dryer?	1	2	16

17-20|BK

2a. There are several ways in which electricity can be generated. Do you think that we should produce our electricity by using . . .

	Yes	No	*(Don't know)*	
(1) Natural gas?	1	2	*8*	21
(2) Oil from wells?	1	2	*8*	22
(3) Hydroelectricity from dams?	1	2	*8*	23
(4) Coal from strip mining?	1	2	*8*	24
(5) Coal from deep shaft mining?	1	2	*8*	25
(6) Solar energy from the sun?	1	2	*8*	26
(7) Nuclear energy?	1	2	*8*	27
(8) Wind energy from windmills?	1	2	*8*	28

b. Which one source should be used the most? *(Show Card 1)* . . #__________ 29

30-77|BK

3a. Some sources of electric power cause much less pollution than others, but they are also more expensive. Do you think that the country should use more of these pollution-free sources, even if it means that the cost of electricity would go up by, say, 10%?

Yes 1 78
No *(Skip to Q.4)* 2

b. What if the cost would go up by 25%. Would you favor using these pollution-free sources?

Yes 1 79
No *(Skip to Q.4)* 2

80|1
1-4|DUP

c. What if the cost would go up by 50%. Would you favor using these pollution-free sources?

Yes 1 5
No 2

4. Windmills could be located in various places. Would you approve, disapprove or not care if they were put . . .

6-16|BK

	Approve	Not care	Disapprove	
a. Along roads in rural areas? . . .	1	2	3	17
b. Along interstate highways?	1	2	3	18
c. In open fields?	1	2	3	19
d. On the slopes of hills or mountains?	1	2	3	20
e. Along the shores of lakes or oceans?	1	2	3	21

22-26|BK

5a. Please look at the picture in the viewer. How pleasing to the eye do you find the things in this picture? Would you say . . .

	Slide 1	Slide 2	Slide 3	Slide 4
Very pleasing,	1	$1_{27,28}$	1	$1_{52,53}$
Somewhat pleasing,	2	2	2	2
Not too pleasing, or	3	3	3	3
Not at all pleasing?	4	4	4	4
(Don't know)	*8*	*8*	*8*	*8*

b. What do you think of the windmill in this picture? Do you think if it were not there the scene would be . . .

	Slide 1	Slide 2	Slide 3	Slide 4
More pleasing,	1	$1_{29,30}$	1	$1_{54,55}$
Less pleasing, or	2	2	2	2
No different?	3	3	3	3
(Don't know)	*8*	*8*	*8*	*8*

---

c. Of the 2 pictures you have just seen, which one do you think is more pleasing to the eye, the first, or second? *(Show slides again if necessary.)*

First *(#1, Horiz, Lattice, Farm)*	1_{31}	First *(#3, Horiz, Lattice, Shore)*	1_{56}
Second *(#2, Eggbeater, Farm)*	2	Second *(#4, Old Dutch, Shore)*	2
(Don't know)	*8*	*(Don't know)*	*8*

32-51 | BK

Now I'd like to ask you a few questions about you and your family so that we can see how your opinions compare with those of other people.

6. Where do you live? ______________________________ 57,58

(City) *(State)*

7. Please look at this card and tell me which category best describes where you live. *(Show Card 2)*

City of 100,000+ 1 59

Suburb of city 2

Town of 50-100,000 3

Town of 10-50,000 4

Town of 5-10,000 5

Town of 1-5,000 6

Town of less than 1,000 7

Rural area 8

8. Do you live in . . .

A single family house or duplex, ... 1 60

An apartment, condominium or multi-family house, or 2

A mobile home or trailer? 3

Other *(Specify)* ______________________________ 4

9. Do you own or rent your home?

Own 1 61

Rent 2

10a. What is the main occupation of the head of the household, that is, what kind of work does he/she do? 62|BK

______________________________ 63-65

66,67

b. What is his/her job title?

____

c. In what type of business or industry is that?

____

d. Is this mainly . . .

Manufacturing, ... 1

Wholesale, ... 2

Retail, ... 3

Service, or 4

Something else? *(Specify)*

______________________________ 5

11a. Including yourself, how many people live in your household? ______ 68,69

b. How many are under 18? ______ 70

12. In what year were you born? ______ 71,73

13. What is the highest level of formal education you obtained?

Grammar school or less 1 74
Some high school 2
High school graduate 3
Some college 4
College graduate 5
Post graduate degree 6
75-77|BK

THANK YOU FOR YOUR COOPERATION.

14. Sex of respondent *(Circle--but do not ask)*

Male 1 78
Female 2

15. Race of respondent *(Circle--but do not ask)*

White 1 79
Black 2
Spanish speaking 3
Oriental 4
80|2

(Time interview ended ______ [ ]*AM*
[ ]*PM)*

Interviewer signature ______________________________

Interviewer ID# ________________

Date of interview ________________________

Coder ID# ____________________

Check-coder ID# _______________

ID#________ 1-4

Study # 251 5-7

8-10 | BK

8/76

SURVEY RESEARCH LABORATORY

UNIVERSITY OF ILLINOIS

WIND ENERGY STUDY

WIND ENERGY MACHINE SITE

STAGE 2

(Time interview began _______ [ ] *AM)*
[ ] *PM*

1. Do you use electricity in your home for . . .

	Yes	No	
a. Central heating?	1	2	11
b. Central air-conditioning?	1	2	12
c. Room air-conditioner?	1	2	13
d. Hot water heater?	1	2	14
e. Cooking with an electric range?	1	2	15
f. Drying clothes with an electric dryer?	1	2	16

17-20 | BK

2a. There are several ways in which electricity can be generated. Do you think that we should produce our electricity by using . . .

	Yes	No	*(Don't know)*	
(1) Natural gas?	1	2	*8*	21
(2) Oil from wells?	1	2	*8*	22
(3) Hydroelectricity from dams?	1	2	*8*	23
(4) Coal from strip mining?	1	2	*8*	24
(5) Coal from deep shaft mining?	1	2	*8*	25
(6) Solar energy from the sun?	1	2	*8*	26
(7) Nuclear energy?	1	2	*8*	27
(8) Wind energy from windmills?	1	2	*8*	28

b. Which one source should be used the most? *(Show Card 1)* . . #________ 29

30-77 | BK

3a. Some sources of electric power cause much less pollution than others, but they are also more expensive. Do you think that the country should use more of these pollution-free sources, even if it means that the cost of electricity would go up by, say, 10%?

Yes 1
No *(Skip to Q.4)* 2
78

b. What if the cost would go up by 25%. Would you favor using these pollution-free sources?

Yes 1
No *(Skip to Q.4)* 2
79

80|1
1-4|DUP

c. What if the cost would go up by 50%. Would you favor using these pollution-free sources?

Yes 1
No 2
5

4. Windmills could be located in various places. Would you approve, disapprove or not care if they were put . . .

6-16|BK

	Approve	Not care	Disapprove	
a. Along roads in rural areas? . . .	1	2	3	17
b. Along interstate highways?	1	2	3	18
c. In open fields?	1	2	3	19
d. On the slopes of hills or mountains?	1	2	3	20
e. Along the shores of lakes or oceans?	1	2	3	21

5a. If you'll look over there, you'll see an actual windmill that we have constructed here. How pleasing to the eye do you find it? Would you say . . .

Very pleasing, ... 1 22
Somewhat pleasing, ... 2
Not too pleasing, or 3
Not at all pleasing? 4
(Don't know) 8

b. Do you think if it were NOT there the scene would be . . .

More pleasing, ... 1 23
Less pleasing, or 2
No different? 3
(Don't know) 8

c. Do you think that this windmill would be more pleasing in another location in this area?

Yes 1 24
No *(Skip to Q.6a)* 2

(If Yes)

(1) Where? ______________________________ 25,26

____

6a. Please look at the picture in the viewer. How pleasing to the eye do you find the things in this picture? Would you say . . .

	Slide 1	Slide 2	Slide 3	Slide 4
Very pleasing, ...	1	$1_{27,28}$	1	$1_{52,53}$
Somewhat pleasing, ...	2	2	2	2
Not too pleasing, or . . .	3	3	3	3
Not at all pleasing? . . .	4	4	4	4
(Don't know)	*8*	*8*	*8*	*8*

b. What do you think of the windmill in this picture? Do you think if it were not there the scene would be . . .

	Slide 1	Slide 2	Slide 3	Slide 4
More pleasing, ...	1	$1_{29,30}$	1	$1_{54,55}$
Less pleasing, or	2	2	2	2
No different?	3	3	3	3
(Don't know)	*8*	*8*	*8*	*8*

c. Of the 2 pictures you have just seen, which one do you think is more pleasing to the eye, the first, or second? *(Show slides again if necessary.)*

First *(#1, Horiz, Lattice, Farm)* . . 1_{31}	First *(#3, Horiz, Lattice, Shore)* . 1_{56}
Second *(#2, Eggbeater, Farm)* 2	Second *(#4, Old Dutch, Shore)* . . . 2
(Don't know) *8*	*(Don't know)* *8*

32-51 | BK

Now I'd like to ask you a few questions about you and your family so that we can see how your opinions compare with those of other people.

7. Where do you live? ______________________________ 57,58
(City) *(State)*

8. Please look at this card and tell me which category best describes where you live. *(Show Card 2)*

City of 100,000+ 1 59
Suburb of city 2
Town of 50-100,000 3
Town of 10-50,000 4
Town of 5-10,000 5
Town of 1-5,000 6
Town of less than 1,000 7
Rural area 8

9. Do you live in . . .

A single family house or duplex, ... 1 60
An apartment, condominium or multi-family house, or 2
A mobile home or trailer? 3
Other *(Specify)* ______________________________ 4

10. Do you own or rent your home?
Own 1 61
Rent 2

11a. What is the main occupation of the head of the household, that is, what kind of work does he/she do? 62 | BK

______________________________ 63-65
66,67

b. What is his/her job title?

____

c. In what type of business or industry is that?

____

d. Is this mainly . . .

Manufacturing, ... 1
Wholesale, ... 2
Retail, ... 3
Service, or 4
Something else? *(Specify)*
______________________________ 5

12a. Including yourself, how many people live in your household? ______ 68,69

b. How many are under 18? ______ 70

13. In what year were you born? ______ 71,73

14. What is the highest level of formal education you obtained?

Grammar school or less 1 74
Some high school 2
High school graduate 3
Some college 4
College graduate 5
Post graduate degree 6

75-77 | BK

THANK YOU FOR YOUR COOPERATION.

15. Sex of respondent *(Circle--but do not ask)*

Male 1 78
Female 2

16. Race of respondent *(Circle--but do not ask)*

White 1 79
Black 2
Spanish speaking 3
Oriental 4

(Time interview ended ______ [ ] *AM*
[ ] *PM)*

80 | 2

Interviewer signature ______________________________

Interviewer ID# ________________

Date of interview ______________ _________

Coder ID# ____________________

Check-coder ID# _______________

OFFICE USE ONLY

ID #________________ 1-4

Study #251 5-7

SURVEY RESEARCH LABORATORY
UNIVERSITY OF ILLINOIS

The Survey Research Laboratory of the University of Illinois is studying public attitudes toward sources of energy, particularly wind energy machines. As part of this study, would you please fill out this short questionnaire pertaining to wind energy. Thank you.

(Please circle one code number for each question unless otherwise specified.)

1. Why did you come to see this wind machine? *(Circle one.)*

Was in the area and heard about it 1 8

Saw it from the road, was curious 2

Made a special trip to see it because of interest/ professional affiliation with the subject area 3

Had other business at this base 4

Other *(Specify)* ____________________________________

____

2. If this wind machine were NOT here, would this area be . . .

More pleasing 1 9

No different 2

Less pleasing 3

3. Would you be willing to have this wind machine . . .

	Yes	Maybe	No	
a. Within sight of your home?	1	2	3	10
b. On a lake shore or sea coast?	1	2	3	11
c. In a national park?	1	2	3	12

4. For large outputs of power, several wind machines would have to be located in any one area. If several wind machines were strung out along a coast line, about 1/2 mile apart, would you approve, not care, or disapprove?

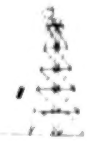
Approve 1 13

Not care 2

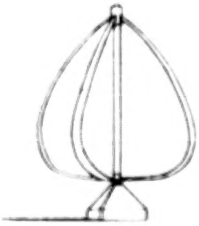
Disapprove 3

5. There are many possible designs for wind energy machines, three of which are shown below. Which one of these three do you prefer? *(Circle one number.)*

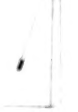
(1)



(2)



(3)



14

6a. Some sources of electric power cause much less pollution than others, but they are also more expensive. Do you think that the country should use more of these pollution-free sources, even if it means that the cost of electricity would go up by, say, 10%?

Yes 1 15
No *(Skip to Q.7a)* 2

b. What if the cost would go up by 25%? Would you favor using these pollution-free sources?

Yes 1 16
No *(Skip to Q.7a)* 2

c. What if the cost would go up by 50%? Would you favor using these pollution-free sources?

Yes 1 17
No 2

So that we can see how your opinions compare with those of other people, we'd like a few facts about you.

7a. Where do you live? ____________ *(City)* ____________ *(State)* 18-19

b. Which one of the following categories best describes where you live?

City of 100,000+ 1 20
Suburb of a city 2
Town of 50-100,000 3
Town of 10-50,000 4
Town of 5-10,000 5
Town of 1-5,000 6
Town of less than 1,000 7
Rural area 8

8. What is your sex?

Male 1 21
Female 2

9. In what year were you born? . . . . ____________ 22-24

10. What is the highest level of formal education you obtained?

Elementary school or less 1 25
Some high school 2
High school graduate 3
Some college 4
College graduate 5
Post graduate degree 6

11. Are you presently . . .

Employed 1 26
Retired/disabled 2
Homemaker 3
Student 4
Temporarily unemployed . 5

27-79 | BK
80 | 1

THANK YOU FOR YOUR COOPERATION.

APPENDIX D

EFFECT OF SLIDE PRESENTATION ORDER ON PUBLIC REACTIONS

The survey design for this study allowed for the possibility that respondents might be influenced in their opinions of the slides by the order in which the slides were presented. It is well known that people tend to get tired of being asked to comment on a repetitive series of questions or visual aids. To judge by past experience, one would expect that because of the effects of fatigue, respondents would be less favorable to slides and windmill designs presented to them later in the interview.

Allowance for the possibility of such an effect was made by rotating Slides 3-14. Slides 1 and 2 could not be included in the rotation because part of the rationale of the survey instrument was to get an initial reading from respondents on a scene containing a string of power lines (Slide 1), followed by a very similar scene containing a string of windmills (Slide 2). It was only after these two slides had been presented that the respondents were shown the individual windmill designs in alternative settings.

Slides 3-14 were placed on three color-coded sheets with questions relating to four slides on each sheet, as follows:

A. Pink sheet--Slides 3-6

B. Blue sheet--Slides 7-10

C. Orange sheet--Slides 11-14

These three sheets were rotated systematically from one interview to another by collating the sheets in three different orders: first, ABC;

second, BCA; and third, CAB. This discussion summarizes the results of studying these order effects.

The basis for the examination of these order effects was a comparison of the answers to two questions for each slide for each area and by each of the rotation patterns. The two questions were those dealing with how pleasing respondents found that particular scene and with their preference between that windmill design and an alternative design shown in the same setting. The basic results are summarized in Table D.1 and are best explained with reference to that table.

Taking Slide 3 as an example, for each area three percentages were obtained on the proportion of the sample finding that scene "pleasing" or "very pleasing," corresponding to the rotational sequences ABC, BCA, and CAB (i.e., whether that slide was presented on the first, second, or third sheet of slides shown). By means of a statistical test (chi-square analysis), a determination was made of the extent to which these three percentages differed from each other and whether these differences might be due to random sampling variation. Where the probability of the differences being due to random sampling variation was 10 percent or less, the relevant orders and the corresponding percentages are shown in the table. To indicate the degrees of significance, these probabilities are shown at three levels, namely, the .10, .05, and .01 levels. These levels reflect increasing likelihood that the differences are "real" in the sense that they are not likely to have been brought about by sampling variations. Thus, where a difference is significant at the .01 level, one would expect a difference of that magnitude only one time out of a hundred as a result of random sampling, a frequency so low as to indicate pretty conclusively that for all practical purposes a strong order effect exists.

TABLE D.1

SUMMARY OF RESULTS OF SLIDE ORDER EFFECTS, BY AREA

(Order of Highest to Lowest Ratings and Range of Percent Rating Favorably)[a]

Slide or slide pair	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area
3--horizontal axis, lattice tower, flat land	1-2-3* (85-73%)		1-3-2*** (76-56%)	1-2-3*** (83-59%)	
4--Darrieus, flat land		1-3-2* (72-58%)	1-3-2* (69-53%)	1-2-3*** (71-50%)	
3 vs. 4				3-2-1* (65-49%)	
5--horizontal axis, columnar tower, hills				1-2-3*** (88-64%)	
6--old Dutch, hills					
5 vs. 6					
7--horizontal axis, old Dutch tower, shore	1-3-2*** (96-77%)	1-3-2*** (89-72%)	1-2-3-** (90-73%)	1-2-3*** (96-78%)	1-3-2*** (91-69%)
8--Giromill, shore		1-3-2** (51-31%)	1-2-3* (48-32%)	1-3-2* (49-35%)	
7 vs. 8	1-3-2*** (94-82%)			1-2-3** (90-77%)	3-1-2* (89-76%)

(Table D.1 continued)

TABLE D.1--Continued

Slide or slide pair	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area
9--horizontal axis, columnar tower, flat land		1-3-2* (86-71%)	1-2-3* (75-57%)		1-3-2** (79-60%)
10--Giromill, flat land					
9 vs. 10					
11--horizontal axis, old Dutch tower, hills		1-2-3*** (88-66%)		1-2-3** (92-77%)	1-2-3*** (93-68%)
12--Darrieus, hills		1-2-3* (73-57%)			
11 vs. 12					
13--horizontal axis, lattice tower, shore					
14--old Dutch, shore					
13 vs. 14					

[a] 1, 2, and 3 refer to the sheet order for each slide.

*Significant at the .10 level.

**Significant at the .05 level.

***Significant at the .01 level.

To simplify the presentation, Table D.1 shows the orders and percentages only where statistically significant results were obtained at the .10 level or more. In those cases, the two extreme orders and the corresponding percentages are given, with the highest percentage always first. Thus, for Slide 3, the table shows that in the Michigan sample, a significant difference at the .10 level was found among the three sets of answers (three sheet randomizations), with 85 percent of the respondents shown Slide 3 on the first sheet responding that it was pleasing, whereas at the other extreme, only 73 percent of those shown Slide 3 on the third sheet thought it pleasing.

Continuing with Slide 3, the table shows that no differences are apparent for the Wyoming sample. A highly significant difference (at the .01 probability level) shows up in the Washington sample. Here, though, the percentages do not decrease in sheet order; that is, the sheet 1 responses were more favorable than the sheet 3 responses, but these, in turn, were more favorable than the sheet 2 responses. Thus, while the sheet 1 presentation of the slide still elicited a more favorable response than when it was presented on the second or third sheet, the relationship was not the linear one expected if true sequence biases were evident. A highly significant difference at the .01 level was also found in the Rhode Island sample, with Slide 3 being regarded favorably 83 percent of the time when shown as part of the first sheet of slides, but only 59 percent of the time when shown on the third sheet. And finally, there were no significant differences found among the three set of answers in the Chicago sample. The rest of the table can be interpreted in a similar manner.

Now, what does this table tell us about order effects? From past knowledge of respondent fatigue, one would expect that if order effects were present, slides that were shown first would tend to be regarded favorably more frequently than if they were shown at a later stage. In terms of the present study, this would suggest the following:

1. Slides 3, 7, and 11 would be most susceptible to order effects because by the rotation pattern they would be shown first one-third of the time and toward the end another third of the time. Where they were shown first, we would expect the proportion of the sample rating them favorably to be highest.
2. In a similar manner, one would expect that Slides 6, 10, and 14 would be subject to a reverse pattern. One-third of the time those slides would be the very last shown, although another third of the time they would be the fourth in the sequence. If order effects were really strong, the proportion of respondents rating these slides favorably would be lower when they were shown last than when they were shown at other stages in the sequence.
3. The same general hypothesis should hold for the other slides, but to a lesser extent. In other words, favorable ratings should be higher when a slide was more forward in the sequence.
4. It is difficult to anticipate the influence of order effects on the question asking people to choose between two scenes, such as choosing whether they prefer Slide 3 or Slide 4. One might expect that the first slide in the sequence could have a slight advantage, but any differences should be less pronounced than for the questions relating to individual slides.

Turning to the table to see the extent to which these anticipations are correct, we find the following:

1. Slides 3, 7, and 11 do indeed exhibit a pronounced order effect. When one of these slides was shown first, it received a much higher favorable rating--in three of the five samples for Slide 3, in all five samples for Slide 7, and in three of the five samples for Slide 11.
2. The slides shown last in the rotation pattern--Slides 6, 10, and 14--show no evidence of any order effects; none of the differences is statistically significant at even the .10 level.
3. Order effects are apparent for some but not all of the other slides. Thus, the slides that were second in some of the sequences--Slides 4, 8, and 12--exhibit order effects nearly half of the time, especially Slides 4 and 8. Fairly strong evidence of order effects is also apparent for Slide 9 (where the differences are statistically significant in three of the five samples), and for Slide 5 to a lesser extent, but the corresponding slide in the third sequence (Slide 13) shows no such effects.
4. Order effects on the question comparing slides are sporadic and not systematic. Thus, in one instance (Rhode Island) where a statistically significant difference was found in preference between Slides3 and 4, the lowest preference for Slide 3 occurred when it was shown first. The only other instances in which order effects are apparent in these comparisons is for Slide 7 versus Slide 8; yet here, in two of the samples, Slide 7 received the highest preference when it was shown first, but in the Chicago sample, it received the highest preference when it was

shown last. No order effects are apparent for the other four questions comparing pairs of slides.

Summarizing, the principal order effects appear for the slides that were shown first in the sequence, with some carry-over effect to slides shown second. The rotation pattern employed corrects automatically for this effect, although the amount of the correction might be understated because a complete rotation pattern was not employed. In other words, if Slide 3 had sometimes been shown the very last (instead of fourth from the last in the sequence BCA), it is possible that the differences in the percentages would have been even larger. From an operational point of view, however, such a procedure was impractical. Also, the fact that the slides actually shown last did not exhibit any order effects suggests that any such additional correction would have been very small or nonexistent.

APPENDIX E

RESPONDENT CHARACTERISTICS

In addition to questions on attitudes toward energy and windmill designs, sample members in this study were asked about the use of electricity in their homes and about various personal characteristics of them and their families, such as their age and education, the occupation of the head of the household, and the family's income. The interviewer also recorded the respondent's sex and race. In the first part of this appendix, we discuss these socio-demographic characteristics, first for the five household samples and second for the two waves at Sandy Hook, New Jersey. Then we turn to their use of electricity. Since the respondents to the self-administered questionnaire distributed at the Plum Brook site were asked only a limited number of these questions, their characteristics are not covered here but are included in the Chapter VI discussion of data from that survey site.

1. Socio-demographic Characteristics

a. Household Samples

The socio-demographic characteristics of the respondents to the five household surveys are presented in Table E.1. Comparing the combined samples to total U.S. census figures indicates that the respondents in

TABLE E.1

SOCIO-DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS IN HOUSEHOLD SURVEYS, BY AREA

(Percent)

Socio-demographic characteristic	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area	All household samples[a]	U.S.
Education:							
Some high school or less	30 [48][b]	22 [34]	24 [46]	29 [45]	25 [47]	26	48[c]
High school graduate	44 [34]	32 [36]	33 [36]	29 [32]	34 [32]	35	31
Some college or more	25 [19]	46 [30]	43 [19]	42 [24]	42 [21]	39	21
Occupation (of head of household):							
Professional-managerial	28	46	32	36	31	35	24[c]
Sales-clerical	8	6	6	8	16	9	12
Craftsman-operative	38	28	35	30	26	31	32
Laborer	16	11	13	15	10	13	11
Unemployed	10	9	14	11	18	12	20
Income (total family):							
Under $7,000	33	26	28	22	21	26	20[d]
$7,000-$11,999	28	21	23	25	10	21	22
$12,000-$19,999	30	33	31	30	36	32	32
$20,000 or over	9	20	18	24	33	21	26
Age:							
Under 30	23 [22]	32 [31]	22 [23]	27 [38]	27 [27]	26	31[e]
30-44	32 [25]	29 [26]	30 [23]	26 [24]	30 [26]	29	25
45-59	22 [26]	19 [24]	20 [27]	24 [21]	24 [25]	22	23
60 or over	23 [27]	20 [19]	28 [27]	22 [17]	19 [21]	23	22
Sex:							
Male	44 [48]	45 [50]	46 [50]	45 [54]	48 [47]	46	48[e]
Female	56 [52]	55 [50]	54 [50]	55 [46]	52 [53]	54	52
Race:							
White	98 [98]	94 [98]	98 [97]	95 [96]	80 [81]	93	88[e]
Nonwhite	2 [2]	6 [2]	2 [3]	5 [4]	20 [19]	7	12
Homeownership status:							
Own	80 [83]	70 [65]	74 [72]	70 [61]	66 [53]	72	63[f]
Rent	20 [17]	30 [35]	26 [28]	30 [39]	34 [47]	28	37
Base (range)[g]	(192-307)	(276-289)	(237-267)	(232-291)	(225-277)	(1,162-1,430)	

(Table E.1 continued)

Footnotes to Table E.1:

[a] These figures represent unweighted summations of the number of interviews in the different areas; they are not weighted by the population sizes of those areas.

[b] Census figures for the individual survey areas given in brackets; based on 1970 Census of Population and Housing volumes for individual states. Education figures are for years of school completed by those 25 years of age and older. No figures are included for occupation or income because comparable census breakdowns are not readily available.

[c] For 1970. *Source:* U.S. Bureau of the Census, *1970 Census of Population: Detailed Characteristics, United States Summary,* Final report PC(1)-D1 (Washington, D.C.: U.S. Government Printing Office, 1973).

[d] For 1975. *Source:* U.S. Bureau of the Census, *Current Population Reports,* Ser. P-60, No. 103, "Money Income and Poverty Status of Families and Persons in the United States: 1975 and 1974 Revisions" (Washington, D.C.: U.S. Government Printing Office, 1976).

[e] For 1976. *Source:* U.S. Bureau of the Census, *Current Population Reports,* Ser. P-25, No. 643, "Estimates of the Population of the United States, by Age, Sex, and Race: July 1, 1974 to 1976" (Washington, D.C.: U.S. Government Printing Office, 1977).

[f] For 1970. *Source:* U.S. Bureau of the Census, *County and City Data Book, 1972* (Washington, D.C.: U.S. Government Printing Office, 1972).

[g] Base varies because of differing number of "No answers" for each question.

these surveys were (1) more highly educated,[1] (2) more likely to have employed heads of households, (3) likely to have a slightly lower family income, (4) somewhat older, and (5) slightly more likely to be female and white than national averages would indicate. Since the five areas sampled by household were not selected on a national probability basis but rather judgmentally, one would not expect exact representation of these demographics. However, in most cases, the figures are near national averages.

For each area, the 1970 census figures (in brackets) are shown next to the percentages for the sample members in the counties surveyed. By comparing these two sets of figures, one can note some further differences: In all areas except western Michigan, the educational level was higher than expected, even vis-à-vis the 1975 levels of educational attainment. The Rhode Island sample was slightly older than the population of its counties would assume. The samples in Michigan, Wyoming, and Washington contained somewhat more females, whereas the Rhode Island sample included many more females than the proportion that the census figures indicate. Although all samples combined included more whites than the national average (93 versus 88 percent, respectively), it can be seen by comparing the individual area samples to census figures for those areas that, for the particular areas in this sample, the proportion of whites to nonwhites is very exact. The difference between the racial composition of the combined samples and the national figure is due to the exclusion of major metropolitan areas and southern states.

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[1] The education comparison figures are not equivalents here: The sample figures indicate educational level for all respondents (18 years of age and older) at the time of the survey (1976). The census figures indicate educational attainment in 1970 of persons 25 years of age and older. The 1975 figures of educational attainment for all persons 18 years of age and older would be the following: less than high school graduate, 35 percent; high school graduate, 38 percent; at least some college, 27 percent.

b. Sandy Hook, New Jersey, Samples

Since the two Sandy Hook, New Jersey, samples (before and after windmill construction) were chosen by sampling motor vehicles entering the site rather than by sampling households, it is not possible to compare these samples to any other figures (no data exist on the characteristics of park visitors). We can, however, note some differences between the two samples. Thus, Table E.2 shows that respondents in Wave II (interviewed after the windmill had been constructed) had a higher educational level and were older than those in Wave I. The Wave II sample also contained more males and more whites.

2. Use of Electricity

As a basis for ascertaining the extent to which they were using electricity in their homes, the sample members in the five household surveys and at Sandy Hook, New Jersey, were asked whether they made use of electricity for six different purposes. These purposes and the frequency with which sample members used electricity for each purpose are shown in Table E.3 by individual area and for all samples combined. Each figure in the table shows what percentage of people interviewed recorded use of electricity for that particular purpose.

It is evident from Table E.2 that the use of electricity for these different purposes varies substantially from one area to another. Except for air conditioning, a much higher use of electricity was reported by

TABLE E.2

SOCIO-DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS, SANDY HOOK, NEW JERSEY (WAVES I AND II)

(Percent)

Socio-demographic characteristic	Wave I	Wave II
Education:		
Some high school or less	12	8
High school graduate	28	24
Some college or more	59	68
Occupation:		
Professional-managerial	48	57
Sales-clerical	12	6
Craftsman-operative	24	21
Laborer	9	4
Unemployed	6	12
Income:		
Under $7,000	-[a]	-[a]
$7,000-$11,999	-	-
$12,000-$19,999	-	-
$20,000 or over	-	-
Age:		
Under 30	48	28
30-44	28	31
45-59	17	29
60 or over	7	11
Sex:		
Male	60	72
Female	40	28
Race:		
White	93	98
Nonwhite	7	2
Homeownership status:		
Own	71	71
Rent	29	29
Base (range)	(307-314)	(322-336)

[a] Income not asked of Sandy Hook samples.

TABLE E.3

USE OF ELECTRICITY IN THE HOME, BY AREA

(Percent Responding "Yes" to Each Use)

Use	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area	Sandy Hook, New Jersey[a]	All samples[b]
Central heating	11	11	70	10	12	22	22
Central air conditioning	3	4	3	3	25	25	10
Room air conditioner	6	17	2	24	44	58	26
Hot water heater	65	20	94	42	11	42	46
Cooking range	55	59	94	75	19	33	55
Clothes dryer	43	66	76	52	21	51	51
Base (range)[c]	(305-307)	(287-289)	(266-267)	(286-290)	(275-277)	(302-314)	(1,725-1,742)

[a] These figures are based on data obtained in the Wave I interviews at Sandy Hook before construction of the windmill.

[b] Unweighted summations.

[c] Base varies because of differing number of "No answers" for each use.

the respondents in western Washington than in any other area. In that particular area, 70 percent of the sample reported using electricity for central heating, compared with only 10 to 12 percent in eastern Rhode Island, western Michigan, southeastern Wyoming, and the Chicago area.

In addition, almost all of the sample members in western Washington reported using electricity for hot water heating, whereas the corresponding figure for Chicago is only 11 percent. Even for clothes dryers, use of electricity was reported by 76 percent of the respondents in western Washington, but by only 21 percent in Chicago.

On the other hand, the sample members in Chicago and at Sandy Hook, New Jersey, reported much higher use of electricity for air conditioning than the samples in the other four parts of the country. In the case of room air conditioning, 58 percent of the Sandy Hook sample and 44 percent of the Chicago sample used electricity for this purpose, compared with only 2 percent of the Washington sample. This undoubtedly reflects the much higher incidence of ownership of air conditioners in the warmer climates of the Chicago and New York areas than in the other four areas sampled.

Overall, the use of electricity for different purposes clearly varies substantially from one area to another. To a large extent, geographical differences in the use of various energy sources would seem to be a major determinant. For example, in Washington, electricity from hydroelectric dams is a major source of home heating, whereas, in the Midwest and East, natural gas and oil are more highly utilized for this purpose.

TABLE F.1

PREFERENCE FOR SOLAR ENERGY AS SOURCE FOR PRODUCTION OF ELECTRICITY, BY SOCIO-DEMOGRAPHIC CHARACTERISTICS AND AREA

(Percent Responding "Yes" to Solar Energy as Source)

Socio-demographic characteristic	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area	Sandy Hook, New Jersey[a]	All samples[b]
Education:							
Some high school or less	88	92**	93	81***	90	95	89***
High school graduate	94	99	94	95	93	95	95
Some college or more	95	98	98	96	96	97	97
Occupation:							
Professional-managerial	93	100**	96	93	99**	97	97***
Sales-clerical	96	100	94	92	90	100	95
Craftsman-operative	94	94	98	89	97	93	94
Laborer	90	91	91	88	88	96	90
Unemployed	83	96	94	97	85	94	91
Income:							
Under $7,000	88	94	93	85**	86***	-[c]	90***
$7,000-$11,999	88	96	94	96	79	-	93
$12,000-$19,999	95	98	98	90	96	-	96
$20,000 or over	100	100	93	98	97	-	98
Age:							
Under 30	95	97	100***	95	91	97	96***
30-44	94	99	99	96	96	95	96
45-59	95	98	96	90	92	98	94
60 or over	86	92	87	85	96	95	89
Sex:							
Male	94	99	95	92	96	98	96**
Female	90	95	96	91	91	94	93
Race:							
White	-[d]	-[d]	-[d]	-[d]	96***	-[d]	
Nonwhite					83		
Base (range)[e]	(175-282)	(268-279)	(228-255)	(226-284)	(204-246)	(301-308)	(1,100-1,652)

[a] In this and subsequent tables in this appendix, the Sandy Hook figures are based on data obtained in the Wave I interviews at that site before construction of the windmill.

[b] Throughout these tables, the "all samples" figures represent unweighted summations of the number of interviews in the different areas; they are not weighted by the population sizes of those areas.

[c] Income not asked of Sandy Hook samples.

[d] Too few nonwhites for reliable comparison.

[e] In this and subsequent tables in this appendix, base varies because of differing number of "No answers" for each question.

** The difference in percentages for this group of figures is significant at the .05 level.

*** Significant at the .01 level.

TABLE F.2

PREFERENCE FOR WIND ENERGY AS SOURCE FOR PRODUCTION OF ELECTRICITY, BY SOCIO-DEMOGRAPHIC CHARACTERISTICS AND AREA

(Percent Responding "Yes" to Wind Energy as Source)

Socio-demographic characteristic	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area	Sandy Hook, New Jersey	All samples
Education:							
Some high school or less	91	89	68**	67***	65	89	78***
High school graduate	92	93	84	87	78	84	87
Some college or more	90	94	86	87	79	89	88
Occupation:							
Professional-managerial	94	95**	83	88	81	87	88**
Sales-clerical	91	100	76	74	76	86	83
Craftsman-operative	93	90	85	78	80	85	86
Laborer	91	81	82	79	62	92	82
Unemployed	79	100	73	79	68	94	80
Income:							
Under $7,000	91	89	77	72	75	-[a]	82
$7,000-$11,999	92	95	82	73	75	-	85
$12,000-$19,999	91	97	84	88	77	-	88
$20,000 or over	88	90	83	84	77	-	83
Age:							
Under 30	94	98	89	80	65	87	86
30-44	96	90	85	87	79	86	88
45-59	88	91	75	80	79	90	84
60 or over	87	90	77	77	85	91	84
Sex:							
Male	93	92	84	81	78	89	86
Female	90	93	79	82	73	86	84
Race:							
White	-[b]	-[b]	-[b]	-[b]	79**	-[b]	
Nonwhite					60		
Base (range)	(180-281)	(271-282)	(227-253)	(217-274)	(185-226)	(297-298)	(1,079-1,613)

[a] Income not asked of Sandy Hook sample.

[b] Too few nonwhites for reliable comparison.

**Significant at the .05 level.

***Significant at the .01 level.

TABLE F.3

RELATIVE FREQUENCY OF PREFERENCE FOR EACH ELECTRIC ENERGY SOURCE, BY SOCIO-DEMOGRAPHIC CHARACTERISTICS, ALL SAMPLES

(Percent Naming Each Source as the One That
"Should Be Used the Most")

Socio-demographic characteristic	Solar energy	Hydro-electricity	Wind energy	Nuclear energy	Coal	Oil and natural gas	Total	Base
Education:***								
Some high school or less	21	32	13	9	9	17	101[a]	(380)
High school graduate	38	26	10	12	5	10	101[a]	(555)
Some college or more	46	22	8	16	5	4	101[a]	(701)
Occupation:***								
Professional-managerial	44	21	10	14	6	6	101[a]	(609)
Sales-clerical	45	23	5	16	3	8	100	(152)
Craftsman-operative	31	29	11	12	8	9	100	(493)
Laborer	28	35	10	9	6	12	100	(201)
Unemployed	34	22	10	12	6	16	100	(178)
Income:***								
Under $7,000	28	31	13	8	4	16	100	(277)
$7,000-$11,999	33	32	12	6	8	9	100	(232)
$12,000-$19,999	36	29	8	15	7	6	101[a]	(349)
$20,000 or over	43	22	7	19	6	3	100	(226)
Age:***								
Under 30	49	20	8	12	3	8	100	(490)
30-44	40	27	12	11	5	6	101[a]	(469)
45-59	31	26	10	16	7	10	100	(338)
60 or over	22	32	10	12	12	12	100	(311)
Sex:***								
Male	37	22	8	19	8	5	99[a]	(788)
Female	37	28	11	7	4	12	99[a]	(849)
Race (Chicago only):***								
White	42	22	6	14	7	9	100	(195)
Nonwhite	20	11	9	4	7	49	100	(45)

[a] Not 100 percent because of rounding.

***Significant at the .01 level.

TABLE F.4

APPROVAL OF POLICY OF MAXIMIZING U.S. PRODUCTION OF ENERGY AND IMPORTING WHATEVER ELSE NEEDED, BY SOCIO-DEMOGRAPHIC CHARACTERISTICS AND AREA

(Percent "Strongly Agree" or "Agree")

Socio-demographic characteristic	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area	All samples[a]
Education:						
Some high school or less	78	73	71	79	68	75
High school graduate	77	73	83	84	66	76
Some college or more	84	76	74	75	66	75
Occupation:						
Professional-managerial	74	79	79	81	72	77
Sales-clerical	96	82	82	88	58	78
Craftsman-operative	77	66	75	78	59	72
Laborer	87	69	63	81	79	77
Unemployed	75	78	85	67	70	74
Income:						
Under $7,000	87	72	74	69	64	74
$7,000-$11,999	83	72	80	82	71	78
$12,000-$19,999	79	79	76	80	59	74
$20,000 or over	82	77	86	87	74	80
Age:						
Under 30	79	72	64**	75	68	72**
30-44	74	73	73	78	62	72
45-59	86	77	81	82	72	80
60 or over	78	78	85	80	68	78
Sex:						
Male	78	77	77	75	65	74
Female	80	72	76	82	69	76
Base (range)	(188-303)	(271-283)	(234-263)	(228-285)	(218-265)	(1,138-1,398)

[a] Except Sandy Hook, New Jersey, where this question was not asked.

**Signifcant at the .05 level.

TABLE F.5

APPROVAL OF POLICY OF MAXIMIZING U.S. PRODUCTION OF ENERGY WHILE LIMITING USAGE, BY SOCIO-DEMOGRAPHIC CHARACTERISTICS AND AREA

(Percent "Strongly Agree" or "Agree")

Socio-demographic characteristic	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area	All samples[a]
Education:						
Some high school or less	86	78	80	82	82	82**
High school graduate	74	77	74	83	76	76
Some college or more	77	78	66	75	75	74
Occupation:						
Professional-managerial	79	75	69	75	75	75
Sales-clerical	79	65	65	83	83	77
Craftsman-operative	79	81	69	79	70	75
Laborer	83	79	82	86	79	82
Unemployed	83	89	76	82	83	82
Income:						
Under $7,000	79	85	71	85	80	80
$7,000-$11,999	77	77	77	74	90	78
$12,000-$19,999	78	76	73	78	75	76
$20,000 or over	76	71	70	78	74	74
Age:						
Under 30	78	81	72	80	76	78
30-44	81	75	69	77	78	76
45-59	74	82	69	80	71	75
60 or over	76	73	76	79	84	77
Sex:						
Male	72**	71**	70	75	74	72***
Female	84	84	72	82	80	81
Base (range)	(190-304)	(276-289)	(231-260)	(227-285)	(219-266)	(1,142-1,403)

[a] Except Sandy Hook, New Jersey, where this question was not asked.

**Significant at the .05 level.

***Significant at the .01 level.

TABLE F.6

APPROVAL OF POLICY OF RATIONING U.S. ENERGY USAGE AND IMPORTING NONE, BY SOCIO-DEMOGRAPHIC CHARACTERISTICS AND AREA

(Percent "Strongly Agree" or "Agree")

Socio-demographic characteristic	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area	All samples[a]
Education:						
Some high school or less	33***	31	28	40	32	33***
High school graduate	16	23	21	25	30	22
Some college or more	12	20	30	24	20	22
Occupation:						
Professional-managerial	19	14**	28	21	15**	19***
Sales-clerical	8	35	24	32	24	24
Craftsman-operative	25	29	20	34	34	28
Laborer	21	38	26	38	22	29
Unemployed	17	28	43	28	40	32
Income:						
Under $7,000	27	28**	32	40	39	32***
$7,000-$11,999	21	34	29	40	24	30
$12,000-$19,999	16	19	26	29	22	22
$20,000 or over	0	11	14	24	26	18
Age:						
Under 30	18	28**	26**	24	25	24**
30-44	18	11	33	29	25	23
45-59	17	26	11	34	23	23
60 or over	30	32	32	34	35	32
Sex:						
Male	20	13***	26	27	31	24
Female	20	32	27	30	21	26
Base (range)	(189-302)	(269-282)	(234-262)	(225-282)	(216-264)	(1,132-1,321)

[a] Except Sandy Hook, New Jersey, where this question was not asked.

**Significant at the .05 level.

***Significant at the .01 level.

TABLE F.7

BEST ENERGY POLICY ALTERNATIVE, BY SOCIO-DEMOGRAPHIC CHARACTERISTICS, ALL SAMPLES[a]

(Percent Naming Each Alternative as the "Best")

Socio-demographic characteristic	Produce maximum, import rest	Produce maximum, limit usage	Ration, import none	Total	Base
Education:					
Some high school or less	33	53	14	100	(358)
High school graduate	38	53	9	100	(491)
Some college or more	35	56	10	101[b]	(552)
Occupation:*					
Professional-managerial	38	56	6	100	(485)
Sales-clerical	32	58	10	100	(125)
Craftsman-operative	34	51	15	100	(436)
Laborer	35	54	11	100	(185)
Unemployed	33	54	13	100	(167)
Income:					
Under $7,000	34	53	13	100	(292)
$7,000-$11,999	28	57	15	100	(240)
$12,000-$19,999	37	53	10	100	(368)
$20,000 or over	44	50	6	100	(241)
Age:*					
Under 30	30	59	11	100	(364)
30-44	34	56	10	100	(400)
45-59	43	47	10	100	(304)
60 or over	36	52	12	100	(307)
Sex:					
Male	38	51	11	100	(640)
Female	33	57	10	100	(762)
Race:					
White	36	53	11	100	(1,308)
Nonwhite	30	63	6	99[b]	(95)

[a] Except Sandy Hook, New Jersey, where this question was not asked.

[b] Not 100 percent because of rounding.

*Significant at the .10 level.

TABLE F.8

SENSITIVITY TO 10-PERCENT INCREASE IN COST OF ELECTRICITY TO PAY FOR POLLUTION-FREE ENERGY, BY SOCIO-DEMOGRAPHIC CHARACTERISTICS AND AREA

(Percent Responding "Yes" to 10 Percent Increase)

Socio-demographic characteristic	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area	Sandy Hook, New Jersey	All samples[a]
Education:							
Some high school or less	48***	67***	72**	43***	52***	65***	56***
High school graduate	73	77	86	61	70	66	72
Some college or more	76	90	89	75	76	85	82
Occupation:							
Professional-managerial	82***	83	87	65	74***	81	79***
Sales-clerical	79	76	65	58	84	82	76
Craftsman-operative	64	81	85	50	61	67	68
Laborer	51	76	88	71	57	80	69
Unemployed	42	78	79	69	64	78	67
Income:							
Under $7,000	46***	72	78	61	54***	35	63***
$7,000-$11,999	80	90	89	64	52	64	78
$12,000-$19,999	78	84	88	66	68	57	77
$20,000 or over	65	80	88	69	81	61	78
Age:							
Under 30	78	87***	96**	73**	73	82	81***
30-44	65	88	83	66	70	76	74
45-59	62	80	85	50	73	69	69
60 or over	57	63	75	56	59	77	63
Sex:							
Male	58**	78	85	61	72	77	72
Female	72	83	83	62	65	77	73
Race:							
White	-[a]	-[a]	-[a]	-[a]	74***	-[a]	
Nonwhite					45		
Base (range)	(192-306)	(275-288)	(234-262)	(228-285)	(224-275)	(151-311)	(1,693-1,796)

[a] Too few nonwhites for reliable comparison.

**Significant at the .05 level.

***Significant at the .01 level.

TABLE F.9

KNOWLEDGE OF SOLAR ENERGY AS SOURCE OF ELECTRICITY,
BY SOCIO-DEMOGRAPHIC CHARACTERISTICS AND AREA

(Percent Having Heard Anything About Source)

Socio-demographic characteristic	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area	All samples[a]
Education:						
Some high school or less	63***	52***	65***	67***	43***	59***
High school graduate	71	84	80	87	72	77
Some college or more	88	91	87	98	85	90
Occupation:						
Professional-managerial	82**	85***	83	94***	79**	85***
Sales-clerical	88	88	82	96	84	87
Craftsman-operative	70	82	77	80	65	75
Laborer	60	52	77	77	64	66
Unemployed	71	78	67	76	58	69
Income:						
Under $7,000	65**	67***	71	72***	54***	66***
$7,000-$11,999	59	79	80	81	59	73
$12,000-$19,999	79	87	82	90	78	83
$20,000 or over	88	88	91	96	85	89
Age:						
Under 30	74	86***	78	86	66	78**
30-44	75	87	79	92	76	82
45-59	71	82	76	85	74	78
60 or over	71	59	78	81	64	71
Sex:						
Male	74	84	89***	86	81***	83***
Female	73	77	68	85	60	73
Race:						
White	-[b]	-[b]	-[b]	-[b]	78***	
Nonwhite					39	
Base (range)	(192-307)	(276-289)	(237-267)	(232-291)	(225-277)	(1,161-1,430)

[a] Except Sandy Hook, New Jersey, where this question was not asked.

[b] Too few nonwhites for reliable comparison.

**Significant at the .05 level.

***Significant at the .01 level.

TABLE F.10

KNOWLEDGE OF WIND ENERGY AS SOURCE OF ELECTRICITY, BY SOCIO-DEMOGRAPHIC CHARACTERISTICS AND AREA

(Percent Having Heard Anything About Source)

Socio-demographic characteristic	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area	All samples[a]
Education:						
Some high school or less	60	48**	43**	56	28***	48***
High school graduate	71	60	49	60	29	55
Some college or more	76	70	63	69	47	65
Occupation:						
Professional-managerial	75	67	54	66	42	62**
Sales-clerical	75	59	65	54	30	52
Craftsman-operative	67	59	58	65	37	58
Laborer	56	52	46	63	32	51
Unemployed	71	63	47	54	33	51
Income:						
Under $7,000	54***	61	54	52	38	53
$7,000-$11,999	59	58	51	49	41	53
$12,000-$19,999	81	65	63	67	38	61
$20,000 or over	76	68	49	66	36	55
Age:						
Under 30	69	60	53	53	28	53
30-44	69	63	51	71	35	58
45-59	61	70	48	60	39	56
60 or over	76	56	61	71	45	63
Sex:						
Male	70	73***	66***	68	46***	65***
Female	68	53	43	59	27	51
Race:						
White	-[b]	-[b]	-[b]	-[b]	38	
Nonwhite					28	
Base (range)	(192-307)	(276-289)	(237-267)	(232-291)	(225-277)	(1,161-1,430)

[a] Except Sandy Hook, New Jersey, where this question was not asked.

[b] Too few nonwhites for reliable comparison.

**Significant at the .05 level.

***Significant at the .01 level.

TABLE F.11

ATTITUDE TOWARD IDEA OF USING WINDMILLS TO GENERATE ELECTRIC POWER, BY SOCIO-DEMOGRAPHIC CHARACTERISTICS AND AREA

(Percent Responding "Good Idea")

Socio-demographic characteristic	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area	All samples[a]
Education:						
Some high school or less	78	65	56	64	44	63
High school graduate	79	67	62	54	57	66
Some college or more	81	76	62	66	57	68
Age:						
Under 30	78	68	65**	58	50	64***
30-44	82	78	66	65	56	70
45-59	74	63	56	64	52	62
60 or over	83	71	53	62	63	67
Race:						
White	-[b]	-[b]	-[b]	-[b]	55**	
Nonwhite					51	
Base (range)	(285-292)	(282-283)	(258-262)	(260-271)	(241-242)	(1,325-1,348)

[a] Except Sandy Hook, New Jersey, where this question was not asked.

[b] Too few nonwhites for reliable comparison.

**Significant at the .05 level.

***Significant at the .01 level.

TABLE F.12

PUBLIC REACTIONS TO SLIDE 1 (POWER LINES), BY SOCIO-DEMOGRAPHIC CHARACTERISTICS AND AREA

(Percent Responding "Very" or "Somewhat" Pleasing)

Socio-demographic characteristic	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area	All samples[a]
Education:						
Some high school or less	50	75***	60***	75***	63**	64***
High school graduate	49	64	30	55	30	57
Some college or more	44	48	14	39	16	43
Income:						
Under $7,000	57	67	58	68***	60	62***
$7,000-$11,999	60	58	58	67	68	61
$12,000-$19,999	44	64	51	48	48	52
$20,000 or over	41	47	49	44	44	45
Age:						
Under 30	47	53**	52	49	53	51
30-44	55	54	42	52	48	50
45-59	46	61	57	66	48	56
60 or over	42	78	59	52	58	57
Sex:						
Male	46	60	53	53	48	52
Female	50	59	51	55	56	54
Race:						
White	-[b]	-[b]	-[b]	-[b]	44***	
Nonwhite					83	
Base (range)	(187-301)	(275-278)	(235-265)	(231-290)	(224-273)	(1,151-1,416)

[a] Except Sandy Hook, New Jersey, where this question was not asked.

[b] Too few nonwhites for reliable comparison.

**Significant at the .05 level.

***Significant at the .01 level.

TABLE F.13

PUBLIC REACTIONS TO SLIDE 2 (WINDMILLS),
BY SOCIO-DEMOGRAPHIC CHARACTERISTICS AND AREA

(Percent Responding "Very" or "Somewhat" Pleasing)

Socio-demographic characteristic	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area	All samples[a]
Education:						
Some high school or less	65	64	64	71	61	65
High school graduate	63	69	69	73	69	68
Some college or more	60	60	61	67	60	62
Income:						
Under $7,000	55	62	64	72	60	62
$7,000-$11,999	72	66	74	72	76	71
$12,000-$19,999	67	68	73	63	66	67
$20,000 or over	65	61	54	78	62	64
Age:						
Under 30	54**	62	67	69	72	65
30-44	75	60	60	73	62	66
45-59	58	66	78	75	52	65
60 or over	59	69	60	58	65	62
Sex:						
Male	67	64	63	69	63	65
Female	60	64	65	70	63	64
Race:						
White	-[b]	-[b]	-[b]	-[b]	61	
Nonwhite					72	
Base (range)	(190-303)	(274-285)	(234-264)	(229-288)	(221-271)	(1,147-1,410)

[a] Except Sandy Hook, New Jersey, where this question was not asked.

[b] Too few nonwhites for reliable comparison.

**Significant at the .05 level.

TABLE F.14

PREFERENCE FOR SLIDE 1 (POWER LINES) OR SLIDE 2 (WINDMILLS), BY SOCIO-DEMOGRAPHIC CHARACTERISTICS AND AREA

(Percent Preferring Slide 1)

Socio-demographic characteristic	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area	All samples[a]
Education:						
Some high school or less	36	36**	33**	41***	42***	38***
High school graduate	29	21	16	18	24	22
Some college or more	25	18	16	15	16	17
Income:						
Under $7,000	38	25	36**	39***	39**	35***
$7,000-$11,999	39	23	18	24	23	26
$12,000-$19,999	35	21	19	20	20	22
$20,000 or over	12	24	13	6	18	15
Age:						
Under 30	34	16***	10**	25	20	21***
30-44	25	13	15	14	24	18
45-59	33	21	22	25	29	26
60 or over	29	49	33	32	28	34
Sex:						
Male	25	21	21	23	20	22
Female	34	24	19	23	29	26
Race:					17***	
White	-[b]	-[b]	-[b]	-[b]	58	
Nonwhite						
Base (range)	(162-244)	(250-261)	(215-238)	(224-279)	(217-261)	(1,067-1,282)

[a] Except Sandy Hook, New Jersey, where this question was not asked.

[b] Too few nonwhites for reliable comparison.

**Significant at the .05 level.

***Significant at the .01 level.

TABLE F.15

PUBLIC REACTIONS TO SLIDE 3 (HORIZONTAL AXIS, LATTICE TOWER, FLAT LAND), BY SOCIO-DEMOGRAPHIC CHARACTERISTICS AND AREA

(Percent Responding "Very" or "Somewhat" Pleasing)

Socio-demographic characteristic	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area	Sandy Hook, New Jersey	All samples[a]
Education:							
Some high school or less	80	79	62**	76	75**	90	76***
High school graduate	79	72	74	72	78	89	78
Some college or more	78	72	55	61	60	83	69
Income:							
Under $7,000	82	75	66	64	77	-[a]	73
$7,000-$11,999	76	77	64	75	73	-	73
$12,000-$19,999	81	76	67	61	68	-	71
$20,000 or over	65	66	51	74	67	-	65
Age:							
Under 30	72	68	57	66	69	86	72
30-44	82	73	61	72	67	88	74
45-59	82	72	67	78	76	84	77
60 or over	81	84	71	60	68	82	73
Sex:							
Male	79	76	62	70	64	85	74
Female	80	71	64	68	75	86	74
Race:							
White	-[b]	-[b]	-[b]	-[b]	66**	-[b]	
Nonwhite					83		
Base (range)	(191-305)	(275-278)	(235-265)	(232-291)	(225-277)	(301-308)	(1,157-1,733)

[a] Income not asked of Sandy Hook sample.

[b] Too few nonwhites for reliable comparison.

**Significant at the .05 level.

***Significant at the .01 level.

TABLE F.16

PUBLIC REACTIONS TO SLIDE 4 (DARRIEUS, FLAT LAND), BY SOCIO-DEMOGRAPHIC CHARACTERISTICS AND AREA

(Percent Responding "Very" or "Somewhat" Pleasing)

Socio-demographic characteristic	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area	Sandy Hook, New Jersey	All samples[a]
Education:							
Some high school or less	47***	56	49	63	87**	79	62
High school graduate	54	69	63	62	77	85	67
Some college or more	73	64	61	60	70	78	68
Income:							
Under $7,000	56	68	57	60	88	-[a]	65
$7,000-$11,999	59	63	56	64	73	-	62
$12,000-$19,999	55	60	67	62	68	-	63
$20,000 or over	71	64	58	67	76	-	68
Age:							
Under 30	65	58	50	68	80	83	70**
30-44	55	68	62	56	71	80	65
45-59	54	72	59	70	85	77	70
60 or over	56	59	63	54	70	67	61
Sex:							
Male	59	69	63	63	71	79	68
Female	55	60	56	60	81	81	64
Race:							
White	-[b]	-[b]	-[b]	-[b]	73***	-[b]	
Nonwhite					91		
Base (range)	(191-305)	(276-289)	(236-265)	(229-287)	(223-275)	(299-306)	(1,154-1,726)

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[a] Income not asked of Sandy Hook sample.

[b] Too few nonwhites for reliable comparison.

**Significant at the .05 level.

***Significant at the .01 level.

TABLE F.17

PREFERENCE FOR SLIDE 3 (HORIZONTAL LATTICE) OR SLIDE 4 (DARRIEUS), BY SOCIO-DEMOGRAPHIC CHARACTERISTICS AND AREA

(Percent Preferring Slide 3)

Socio-demographic characteristics	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area	Sandy Hook, New Jersey	All samples[a]
Education:							
Some high school or less	68	63**	68***	63	28	43	57***
High school graduate	62	44	56	54	30	30	47
Some college or more	50	44	40	52	42	40	44
Income:							
Under $7,000	65	50	60	56	21	-[a]	52**
$7,000-$11,999	58	56	53	52	29	-	52
$12,000-$19,999	56	48	47	52	39	-	48
$20,000 or over	44	36	40	56	39	-	43
Age:							
Under 30	53	47	47	47	27	35	41***
30-44	58	44	47	56	40	34	47
45-59	64	44	51	59	32	51	50
60 or over	70	59	64	61	38	45	58
Sex:							
Male	61	46	54	58	38	39	48
Female	60	50	51	54	31	36	48
Race:							
White	-[b]	-[b]	-[b]	-[b]	39***	-[b]	
Nonwhite					17		
Base (range)	(180-282)	(263-274)	(228-251)	(223-278)	(219-286)	(296-303)	(1,112-1,654)

[a] Income not asked of Sandy Hook sample.

[b] Too few nonwhites for reliable comparison.

**Significant at the .05 level.

***Significant at the .01 level.

TABLE F.18

PUBLIC REACTIONS TO SLIDE 13, (HORIZONTAL AXIS, LATTICE TOWER, SHORE), BY SOCIO-DEMOGRAPHIC CHARACTERISTICS AND AREA

(Percent Responding "Very" or "Somewhat" Pleasing)

Socio-demographic characteristic	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area	Sandy Hook, New Jersey	All samples
Education:							
Some high school or less	79	77	66	69	64	74	72
High school graduate	72	72	71	71	62	83	72
Some college or more	77	61	60	64	63	80	68
Income:							
Under $7,000	77	75	66	59	64	-[a]	69**
$7,000-$11,999	67	67	71	71	68	-	69
$12,000-$19,999	76	71	67	64	70	-	70
$20,000 or over	71	57	56	67	57	-	60
Age:							
Under 30	66	59**	62	60	55	80	66
30-44	78	66	62	69	67	78	70
45-59	76	68	65	69	67	86	72
60 or over	81	85	71	70	64	77	75
Sex:							
Male	77	72	67	72	62	79	72
Female	74	65	64	63	64	82	68
Race:							
White	-[b]	-[b]	-[b]	-[b]	61	-[b]	
Nonwhite					72		
Base (range)	(191-305)	(276-289)	(236-266)	(230-289)	(222-274)	(306-313)	(1,155-1,735)

[a] Income not asked of Sandy Hook sample.

[b] Too few nonwhites for reliable comparison.

**Significant at the .05 level.

TABLE F.19

PUBLIC REACTIONS TO SLIDE 14 (OLD DUTCH, SHORE), BY SOCIO-DEMOGRAPHIC CHARACTERISTICS AND AREA

(Percent Responding "Very" or "Somewhat" Pleasing)

Socio-demographic characteristic	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area	Sandy Hook, New Jersey	All samples
Education:							
Some high school or less	92	88	91	95	84	87	90
High school graduate	93	85	91	94	90	91	91
Some college or more	94	78	88	88	84	92	87
Income:							
Under $7,000	92	92**	89	92	81	-[a]	90
$7,000-$11,999	94	74	94	93	91	-	89
$12,000-$19,999	91	82	89	91	86	-	88
$20,000 or over	94	77	88	93	88	-	87
Age:							
Under 30	93	81	88	88	88	92	88
30-44	95	83	87	93	90	90	90
45-59	88	89	96	93	81	92	90
60 or over	94	76	88	94	85	86	88
Sex:							
Male	92	79	87	90	85	87***	87***
Female	93	85	92	94	87	96	91
Race:							
White	-[b]	-[b]	-[b]	-[b]	89**	-[b]	
Nonwhite					76		
Base (range)	(191-305)	(276-289)	(236-266)	(232-291)	(223-274)	(303-310)	(1,158-1,734)

[a] Income not asked of Sandy Hook sample.

[b] Too few nonwhites for reliable comparison.

**Significant at the .05 level.

***Significant at the .01 level.

TABLE F.20

PREFERENCE FOR SLIDE 13 (HORIZONTAL LATTICE) OR SLIDE 14 (OLD DUTCH), BY SOCIO-DEMOGRAPHIC CHARACTERISTICS AND AREA

(Percent Preferring Slide 13)

Socio-demographic characteristic	Western Michigan	Southeastern Wyoming	Western Washington	Eastern Rhode Island	Chicago area	Sandy Hook, New Jersey	All samples
Education:							
Some high school or less	15	19	23	13	19	11	17***
High school graduate	8	21	20	10	11	14	14
Some college or more	11	26	17	20	21	21	20
Income:							
Under $7,000	12	19	20	12	22	-[a]	17
$7,000-$11,999	7	30	8	14	18	-	15
$12,000-$19,999	9	24	21	16	14	-	18
$20,000 or over	6	26	24	13	19	-	19
Age:							
Under 30	14	18	18	19	11	14	15
30-44	9	23	20	13	12	26	17
45-59	19	24	20	15	27	14	20
60 or over	5	30	21	17	21	20	18
Sex:							
Male	13	28	20	19	19	24***	21***
Female	10	19	19	12	16	8	14
Race:							
White	-[b]	-[b]	-[b]	-[b]	17	-[b]	-[b]
Nonwhite					20		
Base (range)	(184-292)	(270-282)	(231-259)	(225-282)	(219-270)	(301-308)	(1,129-1,692)

[a] Income not asked of Sandy Hook sample.

[b] Too few nonwhites for reliable comparison.

***Significant at the .01 level.